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RECOMMENDATIONS.

Park Place, August 13, 1833.

Dear Doctors—I have been acquainted for several years with M. Bourgery's *Traité de Petite Chirurgie*, and have often expressed my opinion of the *excellence of it* privately, as well as in my public lectures. We have no such tract, as far as I know, in the English language, and I have frequently regretted that *the value of this book* should be confined to those only who are familiar with the French.

Few persons are aware of the value of the smaller details of the profession, until they become engaged in its toils. I rejoice to find that you intend to make an English version of it. You have my best wishes, and are entitled to the thanks of the profession. With great regard, yours truly,

DRS. ROBERTS AND KISSAM. VALENTINE MOTT.

Chambers-street, Sept. 4, 1833.

Dear Sirs—I have looked over the copy of Bourgery's *Traité de Petite Chirurgie* you left with me for that purpose. It appears to be a *judicious code* of instruction for the performance of the minor operations and manipulations of Surgery. I wish you success in the translation of it.

I am truly yours, ALEX. H. STEVENS.

DRS. ROBERTS AND KISSAM.

Extract from the review of "M. Bourgery's *Traité de Petite Chirurgie*," on page 35, No. 1, Vol. I. of the New-York Medico-Chirurgical Bulletin, edited by George Bushe, M. D., late Professor of Anatomy in Rutger's Medical College, New-York.

"This treatise is from the pen of a surgeon little known on this side of the Atlantic, and it is more than probable that his name is not very widely circulated on the other; still, like many of his cotemporaries, as yet strangers in the republic of medicine, he augurs well. He has written a work on a much neglected subject, and executed it with consummate ability. In the preface, he says he was urged to undertake the work with a view of supplying a deficiency in surgical authorship, every where and by every one admitted.

"It is a fact that at this day we have very many treatises on surgery from the ablest masters in Britain, France, Italy, Germany and America; but while they unfold the intricacies of the more difficult surgical diseases and operations (which by the way occur in comparison with others but seldom, and are treated but by few surgeons), are nearly silent on what our author calls "*Petite Chirurgie*," a branch so extensive as to demand a daily portion of the attention of every physician.

"We are rather disposed to eulogize the performance, and have no hesitation in asserting that *it ought to find a place in the library of every surgeon*, as a useful appendix to the scholastic performances of Cooper, Sabatier, Boyer, G. Helius, Langenbeck, Assilini, Dorsey, and Gibson.

"It is of an advantageous size for the market, and would no doubt well repay a translator."

Boston, Oct. 23, 1833.

Having had occasion to refer to the work of M. Bourgery for some years back, I have formed the opinion that *it is a very useful book to students and practitioners of surgery.* In minute practical details, *it excels* any thing in common use. I think a translation will be a valuable addition to the means of surgical information in this country.

DRS. ROBERTS AND KISSAM. JOHN C. WARREN.

Philadelphia, Nov. 5th, 1833.

It gives me pleasure to say that the elementary work on Surgery by M. Bourgery, and now under translation by Drs. Roberts and Kissam of New-York, appears to me *well calculated for the use of students.* So far as I can judge from examination of a small portion of the English text, justice has been done by the translators to the author of the work.

W. GIBSON, M. D.

Professor of Surgery in the University of Pennsylvania.

Philadelphia, Nov. 6th, 1833.

Dear Sirs—I have examined Bourgery's manual, or work on Lesser Surgery, and am of opinion that it is an *excellent compend,* which contains a great deal of matter that will be *useful to students.* The translation which you are about to make, will deserve a large edition, and I have no doubt will meet with a ready sale. Your's truly,

DRS. ROBERTS AND KISSAM. GEO. M'CLELLAN.

Extract from the review of "M. Bourgery's *Traité de Petite Chirurgie,*" on page 161, No. 1, Vol. V, of the American Journal of the Medical Sciences, from the pen of Wm. E. Horner, M. D., Professor of Anatomy in the University of Pennsylvania.

"M. Bourgery, perceiving a deficiency in the elementary points in the regular treatises on surgery, has undertaken to supply it, and, to do him justice, he has accomplished this in a manner highly satisfactory and instructive; and like one who has a perfect familiarity with all the most useful details of hospital and private practice.

"Being from personal experience acquainted with the wants and resources of country practitioners, he has taken care to indicate such modes of management as are best adapted to their convenience. In this we think he has shown sufficient sagacity, as nothing can be more fruitless to the mass of the profession in the country, than a recommendation of articles and of apparatus, to the use and fabrication of which, neither the circumstances of their patients, nor the general state of the mechanical arts in the neighbourhood, are competent.

"We have risen from a hasty inspection of this work with impressions entirely in favour of it; *it certainly must be a great acquisition to any medical library,* and we earnestly hope, that for the benefit of persons not acquainted with French, an English version may be prepared. W. E. H."

A

TREATISE

ON

LESSER SURGERY;

OR, THE

MINOR SURGICAL OPERATIONS.

BY

BOURGERY, D. M. P.

AUTHOR OF "A COMPLETE TREATISE ON HUMAN ANATOMY, COMPRISING OPERATIVE MEDICINE."

TRANSLATED FROM THE FRENCH,

With Notes and an Appendix;

BY

WILLIAM C. ROBERTS & JAMES B. KISSAM.

New-York.

CHARLES S. FRANCIS, BROADWAY;

E. L. CAREY & A. HART, PHILADELPHIA;

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TO

VALENTINE MOTT, M. D.

Professor of Operative Surgery, with Surgical and Pathological Anatomy, in the College of Physicians and Surgeons, in the City of New York:

Sir,

The translators owe to your precepts and example the knowledge which they possess of their profession; and have enjoyed the inestimable advantages of your able public teaching, which, now for more than twenty years, has contributed largely to the instruction of its junior members. They have experienced your kindness socially and professionally, and entertain for it a lively sense of gratitude. To no one, therefore, could they dedicate, with so much propriety as to yourself, a work upon a science to which your own personal achievements have given such lustre.

With respect and esteem,

They are, Sir,

Your obliged Pupils.

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TRANSLATORS' PREFACE.

In presenting to the profession a work upon the Minor Operations and Manipulations of Surgery, a few words seem necessary to explain its object.

It comes before them boasting of no learned contributors, treating of no arduous efforts of the surgeon's art; it offers no new views of pathological arrangement, nor any change in the method of operation hitherto described in surgical books. Its aim is much more humble: it is a Chirurgia Minor, and embraces only those smaller procedures which every practising professional man is called upon at different times to perform, whatever be his line of business.

It is a detail of what every one would be unwilling to suppose himself, or to be supposed, incapable of executing; and yet, which to be done well, require, first, a well-grounded knowledge of the mode of doing, and secondly, considerable practical experience in the application of that knowledge. Such are: the adaptation of bandages, the introduction of catheters, the various modes of dressing wounds and injuries, venæsection, &c.; to see them performed by others appears easy enough, but to perform them with quickness, neatness, and security, requires ingenuity and practice. They are things which from being small, it is expected will be done well; yet, from their apparent insignificance, are neglected in the period of study, unnoticed by public instructors, and left to chance to be acquired by experience.

Of the necessity of skill in these more trifling duties, and of the importance attached to their performance by the public, who can better judge of the dexterous operation of a venæsection, than of the

ligature of a great artery, all men of experience are able to decide; and they are aware also, how very many persons are called upon daily, nay hourly, to execute these, to whom no opportunities occur in the course of a long life for the accomplishment of more capital operations.

The following passage from the commentaries of the eminent Dr. John Clarke, is so appropriate, that we are induced to insert it:—

"In the course of the life of any medical man, in general practice, it is much more important that he should be able to cup and scarify well and effectually, than that he should understand the best mode of applying a trephine, or performing the operation for a strangulated hernia, or aneurism. But it is too common for students to flock to an operation (which they will themselves most probably never have occasion to perform), attended with great difficulty and danger, and requiring the greatest anatomical skill, to the neglect of those things which occur in daily practice, and which are, therefore, of more importance to be well understood by them."

The work now translated is believed to be nearly unique in its contents, and admirably adapted to fill the void left in the education of candidates for the practice of medicine. To them it is offered, with the confident assurance that its details will be found useful, plain and practical, and well qualified to add to their reputations for skill and dexterity, in frequent and important exercises of their office. To the older practitioner, it is hoped also that it may not be unacceptable; as a means of refreshing the memory upon points whereon time has made its recollections less vivid.

Occasional Notes have been subjoined, and an Appendix added, either as a means of supplying deficiencies, or of mentioning differences between the practice of the author and that of our own standard authorities. It is hoped, that in them, the plan of the work will not be thought to have been departed from, nor its excellence impaired.

AUTHOR'S PREFACE.

We have endeavoured, in the composition of the following treatise, to satisfy a want which has long been felt generally to exist.

Although at the present time we are in possession of very many treatises on Surgery, put forth by professors of extraordinary merit, they, for the most part, embrace the *larger* operations *only*; or, in other words, include only that part of the science for the application of which the fewest opportunities occur in practice, and which therefore devolve but upon a few members of the profession. We are yet in need, however, of some manual specially devoted to that part of the science which it daily falls to the lot of physicians to perform.

We are far from professing, in submitting this volume to the press, to offer to the medical public a work of any originality. Except a few observations of our own, which are scattered through its pages, the rest has all been borrowed from the best books on Surgery, and from the Clinical Lectures of the most eminent professors. The works to which we have been most indebted are those of M. Boyer, M. Lafaye, Mr. Samuel Cooper, *Le Dictionnaire de Médecine*, and more especially the edition of the works of Sabatier, published by MM. Sanson and Bégin.

It will be readily conceded, that in all that concerns the order of the distribution of contents, it was impossible to follow any methodical plan. Limited as we are to the choice of certain parts only of the science, and even in treating of those obliged to retrench in some, whilst we enlarged on others, the *ensemble*, formed from de-

tached topics, must of necessity be irregular. Without being at the pains to establish orders, genera and species, we have only been solicitous to present each subject successively, in the order in which it should be learned by the pupil in the course of his studies. Beneath each article we have collected, under a common title, progressing from the simple to the compound, all the subjects which have reference to it; and, as far as was possible, we have been careful in the rotation of articles, that each should bear some analogy to those between which it occurs. As to the manufacture of apparatus, and the application of topical remedies, from a personal experience of the wants and substitutes of surgeons practising in the country, in this respect, we have, after speaking of the choice and employment of means under each particular circumstance, pointed out others whereby any deficiency may be supplied, by resorting to substances always at hand and in common use. Resources of this nature are often invaluable in urgent cases; for although they do not quite fulfil the therapeutical indication, they enable us at least to wait until the proper remedies or instruments can be procured.

We have attempted to detail with the utmost minuteness every step in the method of operation; and that, without fear of being over-circumstantial; for we are thoroughly convinced that to know facts in detail, they must always have been acquired in a degree beyond what is absolutely necessary for their practical application.

Lastly, upon matters of established doctrine, we have endeavoured to keep the just medium of actual knowledge; whilst for things not entirely proved we have offered our explanations with diffidence, and have attached to them no value beyond that of supposition. Amply convinced that it is a point of the highest importance in an elementary work, not to overload the memory with useless materials, we have sedulously excluded from it all hypothesis; an abuse of which tends but too often to mislead the judgment of the student, and causes him to mistake words for facts.

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A

TREATISE

ON THE

LESSER SURGICAL OPERATIONS.

OF THE DRESSING OF WOUNDS.

Dressing consists in the methodical application which is made to a diseased part of the body of proper means for effecting its recovery. The combination of these means has been called the *Apparatus.* The dressing is a most important point in surgery; and upon the excellence of its performance oft-times depends the cure of wounds, ulcers, fractures, &c., and the success of capital surgical operations. It is of use in preserving the parts in suitable co-aptation, in sheltering them from the contact of air, in protecting them from the action, whether mechanical or chemical, of foreign agents; in keeping the surface of the solution of continuity at an even temperature, in opposing the influence of sudden changes in the atmosphere; in absorbing all exudations from the wound, and in preventing its desiccation; in guarding against the absorption of deleterious miasmata in places which are crowded with the sick; lastly, in facilitating the application of the topical remedies which may be thought necessary for the cure.

To apply dressings as they should be applied requires much quickness and dexterity. In the treatment of the same disease, moreover, difference of circumstances is daily calling for some change in the method; and skill is no where so readily acquired as in the practice of large hospitals.

Of things which are employed in dressing solutions of continuity in soft parts.

INSTRUMENTS FOR DRESSING.

For dressing, different instruments are necessary. Of these the chief are ring-handled forceps; scissors; a spatula, and an instrument for holding a pledget of lint, which in French is called a *mèche.*

The Ring-handled Forceps.—This forceps has two plane branches, jointed as scissors are and riveted after the same manner, so that the instrument is divided into two parts. At the posterior extremity, on the outer side of each branch, are two rings into which the medius finger and thumb are introduced, whilst the index finger, stretched out upon the branches, is of use in directing their motions. The free ends are flattened and have small grooves on them, which serve to aid in prehension when the forceps is closed. Its power of exerting pressure is so much the greater, as the posterior extremity exceeds the anterior in length. This is the most useful of all the instruments; it is employed for removing the different portions of the dressing, and for cleansing the surface of sores with a ball of lint. Or, held like a writing-pen and closed, it is introduced alone, or with a little pledget of lint between the blades, into fistulous abscesses, either to clean them or to extract from them some foreign body.

The Spatula.—A spatula is a flat piece of steel slightly curved in a contrary direction at either end, one of which is scoop-shaped and grooved on its concave surface, and serves occasionally as an elevator to remove solid adherent bodies, such for example, as a tooth loose in its socket, a depressed portion of a bone of the cranium, &c ; the other end is larger, and is used for spreading soft substances on parts of dressings; its edges, which are blunt, are convenient for removing, by gently scraping them, either the hardened pus or stiffened topical applications which may adhere to the neighbourhood of a wound.

The Lint Probe.—This is a metallic wire, bifurcated at one end, and swelling into a button or handle at the other. As its name implies, it is used for placing a pledget of lint between the edges of a wound, the adhesion of which it is desirable to prevent. The lint is placed in the angle of bifurcation: it consists of merely a few filaments, the fibres of which are smoothed down with ointment upon

the probe. In using it, the knob at the end is rested against the palm of the hand, while the probe is supported by the ring and little fingers; the thumb and middle finger, which act in opposition to each other, keep the edge of the pledget against the instrument, and the index finger stretched forth upon it serves to direct its movements. In withdrawing it without the lint, it is useful sometimes to press gently upon it with the index finger of the other hand.

The Scissors.—The uses of scissors are various. It is well to have them of three kinds, viz: straight scissors, scissors which are curved on the back, and flat-wise.

Besides the above instruments, the most indispensably necessary, there are again others which are all absolutely requisite for the daily performance of a number of little operations comprised in dressing. From the need of having them always about the person, they compose, together with those of which we have spoken, what is called a *surgeon's pocket case.* They are—dissecting forceps, a grooved director, a female catheter, a razor, and some bistouries; the latter are of various shapes, the principal of which are the straight, convex, and straight probe pointed; the case is completed by the addition of a caustic holder, a lancet, needles, and some ligatures, simple or waxed, some pieces of court and diachylon adhesive plaster.

The Dissecting Forceps.—It consists of two steel branches, about five inches long, and one third or one half a line* in thickness. They are joined together between the blades at one end, and go tapering off to the other, which ends in a point. From their mutual junction, the two branches, which are at first in contact, go off diverging so as to describe two curves whose convexity at first is opposite; after which the blades converge, so that each concavity is towards the other, becoming parallel for a distance of three lines, which forms their points. The spring from the first curve causes a separation of nearly an inch between the blades. The forceps is closed by making pressure between the thumb, fore and middle fingers, which hold it as a pen. The two points, on their corresponding surfaces, have transverse grooves which exactly receive one another; the elevation of the one into the opposite furrow, and reciprocally. The uses of this forceps are extremely numerous, and in many cases it may be advantageously substituted for the ring-handled one. It is capable, from its shape, of holding the loosest filament with firm-

* A line is the twelfth part of an inch.—*Trans.*

ness. It is likewise employed for seizing separately, deep down among the tissues, a bleeding vessel which it is desirable to tie. When taken in the left hand, it holds and elevates adherent bodies, which it is intended to excise with scissors or the knife.

The Female Catheter.—It is a hollow silver tube, two lines in its internal diameter, and nearly seven inches long: one end is open, wide, and has outwardly two little rings by which it may be held. The other end forms a slight curve, and terminates in a rounded *cul-de sac*, so that it may not injure the parts through which it is made to pass; laterally, it is pierced with two holes, to allow of the passage of the fluid from within or from without. Besides its office as a female catheter, it is sometimes introduced into sinuses, to draw off deep seated purulent collections.

The Razor.—The razor is too well known to require any description; it is frequently called into use for shaving hair in the vicinity of wounds, and upon parts on which operations are to be performed. At times indeed, owing to the size of its blade and to its flatness, it is used to remove at one stroke, the base of projecting excrescences on the surface of the skin.

The Caustic Holder.—This is an ivory or silver case, which unscrews. It contains a *porte-crayon* of the same material, armed with a small cylinder of melted nitras. argenti. This caustic is in daily use for depressing granulations which are cellular, vascular, or too prominent, and also for fungous growths on the surface of ulcers and wounds. It is merely necessary for their cauterization, to pass the nitrate of silver over the parts. After each application it is to be carefully wiped dry.

Needles and Ligatures.—Needles and ligatures are in continual use for sewing together the ends of bandages. As occasion presents, we shall describe the other instruments which are more or less applicable for dressing.

OF LINEN RAGS, OR CLOTHS.

Linen, when used for dressings, should be of flax or hemp, soft, somewhat worn, and washed in lye. It is used in the states of lint, compress, and of strips.

Section I.—*Of Lint.*

Lint is of two sorts, raw and scraped.

Raw lint is composed of intersecting fibres, which cross each

other in every direction; it is made by raveling, thread by thread, small pieces of linen cut into squares. Scraped lint is prepared by rasping the surface of a piece of linen powerfully with the blade of a knife, in such a way as to make a kind of down.

The characteristic qualities of good lint are fineness, softness, sponginess and downiness; it should be white, inodorous, free from knots and foreign bodies of every kind, and its filaments may be from two to four inches long, and sometimes more. But in order to possess all these requisites, lint must be new and have been carefully made. If kept for any length of time, it becomes compact by its own subsidence, and it then requires to be combed and picked, by being separated thread by thread, whilst that which is powdery, or that which has grown yellow and has contracted an unpleasant smell, must be thrown away.

The uses of lint are highly important; when directly applied upon a part, it preserves it from all noxious contact, keeps up an even temperature, produces a slight excitement, and absorbs effused liquids and miasms. Scraped lint in particular, possesses these latter properties, but it sometimes adheres too tenaciously around the wound, and it has the objection of forming, by the drying of the fluids, a covering impervious to the pus which is subsequently secreted. Lint, moreover, acts as a kind of sponge, which may become saturated with medicinal decoctions, or be sprinkled with various remedies in a powdery or soft state.

From some experiments made by M. Gerdy upon the absorbent capacity of lint, it would appear, that that which is made from new cloth, absorbs more largely and quickly than that which is formed from linen somewhat worn, a fact which is opposed to the commonly received opinion. As to fluids, the more aqueous they are, the more easily they are absorbed, and the more oleaginous, the less easily; and this result explains the dryness so often seen on the outer surface of cakes of lint, whilst their inner surface, which has been in contact with the wound, is covered with a copious layer of pus.

M. Percy has employed a cushion of lint, which he caused to be impregnated with gas and vapours, by exposing it to their contact, and has derived benefit from it in the cure of wounds and ulcers.

Lint is employed in multifarious forms, of which the principal are—

The Cushion.—This is a cake of lint of an elongated form, whose

threads are parallel, and laid longitudinally. With a little practice, a regular cushion is readily made. The raw lint is held between the fingers of the right hand, and it lies upon the outer edge, and at the base of the fore-finger of the left hand, the thumb of which, being depressed in the adduction, seizes the projecting filaments; the right hand then is swiftly withdrawn, and leaves upon the left palmar surface a row of parallel threads. By executing the same manœuvre rapidly, several times in succession, a cushion is speedily obtained. They are of many shapes and sizes: square, rectangular, round or oval, according to the form and extent of the parts upon which they are to be applied. For the sake of neatness, the ends are sometimes made smooth; not by folding over the ends which project, by which knots may be made which may do harm, but by clipping them off with scissors. The cushion must be light and full of air, by which it is made spongy: its thickness being proportioned to its other dimensions. This shaped lint has the advantage of presenting a large surface, which it is easy to besmear with different topical applications, and of being easily detached in a mass when dressings are removed.

The Lint Ball.—Lint when rolled between the palms of the hands, forms balls either dense or light. The former serve as so many little sponges, for wiping away the pus contained in deep sinuses; the second, when heaped on the wound of an opened artery, arrest the hæmorrhage; at first, by the compression they exercise, and subsequently, by forming with the clot of blood, a *magma* of solidity sufficient to oppose any flow from within. Balls of lint are also serviceable as the recipients of medicinal agents.

The Pledget of Lint.—A pledget is a mass of lint formed of parallel fibres, which is moulded between the fingers into an ovoid form. It is placed between the lips of a solution of continuity, which we desire to prevent from healing. If it is advisable to introduce them more deeply, they must be surrounded with a waxed thread which is knotted. They are thus easily withdrawn. This apparatus is made available for arresting hæmorrhage, by tamponing the fossa nasalia, the lower extremity of the rectum, and the wound in perineo after the cutting for stone. The size necessarily given to the pledget on this occasion, has obtained for it the name of *tampon*. The number of ligatures necessary for commanding a tampon is increased in proportion to its bulk; they are sometimes seven or eight, and should be joined in one, waxed together, and strongly

knotted on the plug, their free end being brought out to assist in its extraction.

The Tent.—The tent is nothing more than a pledget, knotted and turned over upon itself, so as to form a round and hardened mass. It was formerly used for dilating fistulæ, but its use has been abandoned, owing to the inconvenience which it offers of stretching the parts, and acting like a cork in preventing the issue of fluids.

The Mèche or Wick.—The mèche is a collection of long threads, placed lengthwise as in an ordinary skein, of a flattened form. It is insinuated deeply, as it is, or besmeared with medicinal substances, for the purpose of favoring suppuration; and either to oppose the progress of cicatrization, or else to compel its advance outwardly from the depth of parts, as after the operation for fistula in ano.

The Cushion.—The cushion (*pelotte*), is a collection of lint, which is gathered into a piece of linen, whose edges are then turned up and tied, so as to make a sort of bag. All soft bodies reduced to a small size may be employed for the same purpose; such for example, as small pieces of rag, tow, hemp, bran, &c. It may be made use of to compress externally a hernial aperture, a fistula, or it may be placed mediately upon the course of great vessels, in the absence of better means. It is also an advantageous substitute for the tampon in arresting hæmorrhage; in such a case, the ends of the linen being brought outwards, the size of the pelotte within may be easily increased, by crowding in lint whilst we pull upon the extremities, and thus the lint cannot escape from the cavity we wish to plug. When we desire to remove the apparatus, it is easy to take out this lint little by little, after having untied and separated the ends of the linen cloth. The covering, thus brought down to its original thickness, is itself withdrawn without causing either any disturbance of parts or pressure, which might bring back the hæmorrhage.

Lint, as we have now described it, is the best means for protecting wounds; but it is necessary to be able to supply its place when it is wanting. In England, a light and thin linen cloth is manufactured under the name of *patent lint.* One of its surfaces is downy, and intended to absorb; the other is glazed; it comes in long pieces, like cotton wadding. For use, it is cut into strips of a suitable size. The objection to it is that it is neither a good absorbent, nor sufficiently permeable.

In extreme cases, instead of lint, tow, hemp, cotton wadding, silk, in short every dry, soft, absorbing substance may be resorted to.

Section II.—*Compresses.*

Compresses are pieces of second hand linen, with which parts are covered, and in which they are wrapped up. The surface of a compress should be smooth and even, and free from hems, gathers or plaits.

They are made of all sizes according to the bulk and extent of the parts, and to the use for which they are intended; however, the common size is from twelve to fifteen inches a side.

Their general shape is square, all other figures being derived from this. They are used single, twice or four times doubled.

The Square Compress.—Folded in four or eight, a compress is of use in the simplest dressing of wounds and issues. Once doubled, it forms a long square, which it is usual to apply over the other, beyond whose edges it extends, or on the surface of large wounds, over which it preserves the lint in its place.

The Triangular Compress.—A square compress folded over on itself from angle to angle, like a cravat, makes a triangular one, and becomes of easy adaptation to the bends of the joints.

Lengthening one side to twice that of the other, gives us a right angle, which folded on itself makes a double square; it is used in the same way as the square compress, but especially for adding to the thickness and solidity of dressings.

The Elongated Compress.—This is obtained by making one of the sides three or four times longer than the other. It is used single or folded lengthwise upon itself, for sustaining other dressings, by applying it circularly upon the limbs.

The elongated compress, folded so as to present, like a bandage, great length with little breadth, is of use in making the *graduated compress.* Of this latter apparatus there are two principal forms: the truncated prism, and the pyramid. The first makes a right angle, the diagonal of which is formed by the decreasing of the compress, and to the junction of this diagonal with the side, is owing the truncation which constitutes the narrow surface of the graduated compress. In the pyramidal form, the truncation is mid-way, and the lateral decrease must be regularly symmetrical. The inner surface of the compress is the most narrow, and is applied on the skin; the broad surface is called external, because it is turned outwards.

To make a *graduated compress*, we are to fold one end of the elongated compress transversely, and to a width of six or eight lines, for example; upon this fold we then lay down another, which goes some lines beyond the former; then a third in the same manner, then a fourth, a fifth, and so on until the whole extent of compress is exhausted; thus we obtain a pyramid, gradually decreasing from its summit to its base. It may be made likewise of little detached pieces of linen, of similar lengths, but of different widths, which cover each other, each extending beyond the piece which is next to it, and are sewed together; in this way it is made more solid and even. Graduated compresses are employed to approximate separated parts, such for instance, as the lips of a transverse wound; to separate parts which are in contact, as in fractures of the bones of the fore-arm; for causing denuded integuments to adhere to the subjacent tissues; to make pressure upon the course of a wounded artery, &c. It follows consequently, that their length depends on the width, and their thickness on the depth of the solution of continuity. Compresses are sometimes split to render their application more accurate, and to avoid the formation of folds and cavities.

The Maltese Cross.—A square compress, split from each of its four angles towards the centre, is called the cross of Malta; it adapts itself easily to the free extremity of parts, such as the fingers, the penis, and the stumps of amputated limbs.

The Split Compress.—The elongated compress, split in the centre of its small edges, is called a *sling*, and gives its name to a peculiar bandage of four tails. It is more properly the split compress (*Retractor*) however, when divided into two or three slits on one side only; one of its principal uses is to draw up the muscles, and envelop the bone before it is sawn through in amputation.

The Perforated Compress.—Lastly, the compress so called is one pierced with small holes, made with the points of scissors, which are curved on their flat side, or else with flat scissors, by presenting the linen to the instrument with the tip of the fore finger of the left hand. It is applied simply, or spread with some medicinal preparation, commonly cerate, upon ulcerated surfaces of much extent, such as burns; or it is introduced between the lips of a deep wound, where lint would be inconvenient in immediate contact, such as solutions of continuity which enter the cranium, chest, abdomen, and large joints. Lint in these cases is only applied after the perfo-

rated compress. The holes in the latter allow of the transudation of fluids.

Section III.—*Pieces of Linen, Cloths, &c.*

Under this denomination are included the cloths and napkins which are employed uncut.

The Napkin, folded three or four times, serves for a circular bandage for the chest and abdomen; the bandage is supported by strips of linen, called shoulder straps and thigh pieces, which, being tied before and behind on the upper and lower edges of the bandage, and forming loops as suspenders do, above the shoulder, and in the fold of the thigh, prevent the napkin from moving up or down. This species of bandage, the ends of which are kept in contact by pins merely, is convenient for keeping the parts in apposition in a fracture of the ribs, or in cases of wounds in the abdominal or thoracic parietes.

Guards are linen cloths, six or eight times doubled; they are continually in use for covering cushions and pillows, to collect the matters which discharge from wounds, or are placed beneath the pelvis, to prevent the bed from being soiled by the fœces and urine of the patient, or by the lochia in females. The great facility with which these guards can be removed, and changed as often as is necessary, renders them one of the most valuable of all our means for the preservation of cleanliness.

Section IV.—*Small Bands or Fillets.*

One sort of band or fillet is much used in dressing wounds. They are cut out upon a small compress, spread with cerate, in tongues several inches in length, and eight or ten lines in width; and the incisions on one side are made at very slight distances. These fillets are applied on the edges of solutions of continuity, so as to cover them; their fringed edges, turned outwardly, form curves which follow the sinuosities of the wound, owing to the greater or less divergence of the slits which have been made. Moreover, they may be easily removed, whilst on the contrary, if lint alone be applied, its filaments, owing to the desiccation of the fluids, adhere to the edges of the wound, irritate them, and make them bleed when the dressings are removed, and often even destroy the slender pellicle of incipient cicatrization.

Section V.—*Bands.**

Bands are pieces of linen cut in the direction of the thread, very long, though of but little width. Although new linen is not proper for making them, as it renders them hard, slippery and of difficult application, they ought to be firmer than compresses, to be free like them from hems and selvage, to be stitched on the edges, and the additional pieces by which they are lengthened should be sewn in the button hole stitch. The ends are called *tails.* The German surgeons are now beginning to use bands which are manufactured in one piece. They are made of a clear, lax and light tissue, from two to several fingers in width. Their edges present a row of little loops, or curls, made by the woof-thread being reflected on itself every time that it has crossed the width of the warp. The length of the warp decides that of the band. Their flexibility and softness make it easy and convenient to apply them, and from the advantage they possess of being made of new stuff, and not raveling, they last longer than our bands of worn linen; besides which, additional elegance and solidity is given to the dressing by their accurate adaptation.

Bands vary in their dimensions according to the parts which they are to cover. The narrower they are, the better they can be applied. For bands surrounding the fingers, a width of eight or twelve lines is enough; for those which go round the trunk or thigh, several inches are allowed; but in general, the width is three fingers breadth. This is sufficient for enveloping the head, limbs, and for various other cases. The length of a band also varies from several feet to seven or eight yards; this great extent makes it necessary to roll up the band for use. One end is doubled on itself several times to make a central axis, on which some turns are rolled to fasten it; then by using the thumb and fore finger of the right hand as a pivot, the roll is turned rapidly in the palm of the left hand, upon the outer edge of which the tail of the band passes between the thumb and fore finger; each roll is tightened on the other, in such a way as to make a very compact *rouleau*, in the way that is done for ribbons in the piece, and this is persevered in until the band is exhausted.

* The word Band has been employed in this section instead of the more familiar term *bandage*, with which it is entirely synonymous, because a chapter headed with this word will be found to occur several pages further on, and would, it was feared, give rise to confusion.—*Trans.*

The band rolled up in this way, has one end in the centre and the other free on the circumference, and is then called *single-headed.* Of its two tails, that which is in the middle of the roll being the last applied, is called the *terminal;* and that which hangs loose, and of course is first applied, is called the *initial* end. A roller is *double-headed,* when its two tails, being coiled up in the same way, divide its length into two *rouleaux,* usually of unequal length; the uniting part being called the *centre.*

The Application of Bands.—To employ the *single-headed* roller, the outer surface of the loose, or initial end of the band is applied on the side of the part opposite to the disease, and it is held firm with the tips of the fingers of the left hand, until it has been secured by a few circular turns. During this manipulation, the roll, lightly held between the thumb and fore finger, which act in opposition, is easily undone by turning upon its axis. It is then brought over on the part circularly or obliquely, according to the shape we mean to give the bandage, which shape, independently of the indications we wish to fulfil, is determined by that of the part itself; for instance, a figure of eight for a joint, and a circular band for a median part. As the sides change, the band is passed from one hand to the other; and when its whole length is exhausted, the terminal end is fastened by a pin on the healthy side, where the application of the other end had been commenced.

The nature of the material of which bands are made, its stiffness or elasticity, its gloss, or the downiness of its surface, its state of dryness or moisture, the degree of tension, &c., influences greatly the evenness and neatness of their application: hence the flannel bands used by the Scotch are extremely good, owing to their villous surface, and to their elasticity, which causes them to adhere to the skin. Calico bands used in England, and now commencing to be employed in France, hold the middle place. The worst are those made of new and glossy flax linen; and therefore old linen is selected, on account of its furze. Bands are commonly wetted to facilitate their application.

There are several precepts, which in putting on bands it would be well to follow: first, although the head or roll must be held lightly, care must be taken not to let it slip from the hand, whereby the whole apparatus will come undone, and give rise to the necessity of rolling it all up again, as also it will expose it to injure, more or less, the diseased part; secondly, the band should always be exactly

stretched, and so much only must be unrolled, as is necessary to cover the surface of the limb upon which we are acting; thirdly, each time that we change the surface, we are to give to the centre of the bandage the direction which it is to assume; fourthly, the application of the band must be made very flatly, and as smoothly as possible, avoiding all creases and folds which might hurt the skin, or affect the solidity of the dressing; fifthly, we must be careful neither to shake or jostle the limb, which in cases of fracture, or of incipient cicatrization, might do serious injury; sixthly and lastly, we must never tighten a bandage too much, particularly when it is applied to the median part of a limb of which one extremity is at liberty, the constriction exercised being capable of producing œdematous congestion of a violet hue, or even mortification, of which M. Percy relates many examples. In cases which call for the exercise of pressure on a part, it should be commenced at the extremity of the limb, for instance the toes, and ascend to the part of the leg or thigh at which it is to cease.

The circumvolution of a band around a part has received different names.

If, starting from one point, the tail of the band which surrounds the part perpendicularly is brought back to the same point again, this is called a *circular turn.* It follows that a series of circular turns must cover each other completely, as is the case in the kind of cravat which is applied to the nape of the neck, for keeping a blister there. But if, after the first few circular turns, the band be obliquely directed, so as to diverge from the starting point, going either up or down, the layers of the bandage will either cover one another in a portion only of their width, or else they will be isolated between each other, and the band will then be called *spiral.* It seems necessary to remark, that spiral bands are less solid than the two third layers mentioned, which latter will be stronger as they approach nearer to the circular.

Single-headed Band.—The application of bands can never be always uniform, because the different parts upon which they are applied have more or less irregularity of shape, and alternately increase and diminish in size. Taking the leg as an example, it is a limb which increases progressively from the ankle to the calf, where it receives a considerable augmentation of volume. Suppose that the band be applied in layers going up from the lower extremity, it is evident, that as the dimensions of the limb increase, the upper

edge of each layer only will touch the skin; the lower edge, and one part of the middle of the band will go off from it, and make a cavity. To avoid the formation of these cavities, which will slacken the apparatus and cause unequal pressure, the band is turned over on itself, so that its inner surface becomes the outer, and its upper edge the lower, and a fold is made, whose back looks upward and its cavity downward: this fold is called *reversed.* The same is done with every other turn, until the largest part of the calf is arrived at; above this, the leg lessening in size to the knee, we recur anew to reversed folds, but turned down in an opposite direction: *i. e.*, the lower edge is to become the upper, the back of the fold being turned down, and its cavity up. The same thing is to be done in all analogous cases.

Double-headed Band.—The mode of applying a double-headed roller is somewhat different from the preceding. Two procedures are resorted to, for intercrossing the heads in two opposite points.

First Procedure.—You hold a head in each hand; the outer surface of the intermediate centre between each roller, is applied upon a point of the circumference you desire to envelop; you bring the two heads to the point diametrically opposite, and cross them by changing hands; deviate them slightly, that the layers may lie side by side without forming folds, then the heads are brought back on the other side, where they are intercrossed flat-wise in like manner. These circular turns are repeated until the band is exhausted, with very slight deviations only of the intercrossings, so that all the turns may not be in the same place, as by their superposition a hard mass may be formed, and injure the skin. When the shortest head is used up, the terminal end is fastened by the last circular turns of the longer head.

Second Procedure.—This differs from the preceding in so much that instead of intercrossing the centres, one by the side of the other, you produce what is called an intercrossing by reversed folds, which is done as follows:—Two heads, which for the better understanding of the process, we shall call A and B, being brought to the point opposite to that on which the intermediate centre is applied, the head A follows the first perpendicular direction, at the same time that the head B is made to pass between that and the part upon which we are acting, and is directed obliquely upwards or downwards. When the centre of the globe A is applied, you reverse the globe B, either from above downwards, or else from below upwards, upon the upper or lower edge of A,

according to the direction of the obliquity given to B, and the centre of this latter will be found to be brought back like the other to the perpendicular direction, and both are carried up towards the point of departure at which they are again intercrossed, and so on to the exhaustion of both rollers. This is a very solid way of applying bandages. When so modified that the globe B shall always be reflected on A at a right angle, A constantly describing transverse circular turns, but so that the back of the fold shall be turned in a contrary direction to its free extremity, it constitutes the different double roller headstalls employed for the head, and on stumps after amputations.

OF ADHESIVE MATERIALS.

The use of adhesive plasters, either as a means of effecting union or of preventing friction, is very common. In the latter case, large pieces are employed; in the former, strips or straps.

Diachylon Plasters.—These are used to cover surfaces, which threaten to inflame and ulcerate from too long-continued pressure; such are the regions of the sacrum and great trochanters in persons afflicted with paraplegia, with fractures of the lower extremities, or who have been confined to a recumbent position for a length of time by tedious illness. In these cases the skilful surgeon foresees the possibility of sloughs forming, and does not delay his protecting application to the skin until it have become red or painful to the patient. A piece of plaster cloth of sufficient extent not only to cover the diseased part entirely, but to extend beyond it for at least an inch in every direction, is cut off. The form of the plaster applied is not a matter of indifference for its accurate adaptation; a square piece adheres more exactly than one which is round, but in this case it is well to clip off the angles, which otherwise are likely to turn up. Moreover, incisions should be made into the plaster in its entire outline; for instance, in a square piece after the manner of the cross of Malta, at its four angles and in their intervals. Each isolated extremity adheres better in this way, than the whole piece would do, of which one part will rise up while another sticks, owing to the curves described by all parts of our bodies. It is well at each slit made in the piece, to remove a triangular portion extending from the circumference towards the centre, in order that the angles of the isolated extremities may not overlap each other: these double thicknesses, by burying themselves in the skin, often giving rise to excoriations. We have

just seen that the regular curve, or the inequalities of surface upon which the plaster is laid, may either favour or oppose the smoothness of its application. Accordingly, in emaciated individuals, the bony prominences of the sacrum or great trochanters rising beneath the skin, make a surface so very irregular, that apply a plaster as you will, it creases and always forms cavities. And yet it is under such circumstances as these, that the want of something which will prevent the friction and chafing of the skin against the sheets, is most imperiously felt.

The extreme readiness with which gangrenous ulcer occurs in persons reduced to the thinness almost of skeletons, has long been observed. In many persons, a pressure continued for only twenty-four hours, has been sufficient to establish it; and we have seen in large hospitals, those in whom, independently of the trochanters and sacrum, they had taken place upon the shoulders, elbows, and knees, in short on every part of the body upon which these unhappy creatures rested, as pain and suffering compelled them to seek relief in a change of position.

As this thinness is co-existent with debility, the rapid formation of sloughs has justly been attributed to this cause; but perhaps without stress enough being laid upon the influence of such powerful pressure in these patients exercised between the bony prominences, which are almost sub-cutaneous, and the mattress, so that the integuments are strangulated, as it were, between two opposing forces. The application of a plaster, though often insufficient in these cases, as it has no power to diminish the pressure, has the advantage at least of preventing any direct chafing of the skin.

To apply a diachylon plaster of any size, we begin by softening it by the fire, and then cause it to adhere in the centre, after which every one of its free edges is successively pressed down, care being taken not to make folds. The hand is held over it long enough to make its adhesion more complete. Sometimes, in spite of every precaution, the creases which appear in different parts indicate the presence of air beneath the plaster. As these *bullæ*, by their own rarefaction, may serve to detach the plaster, it becomes necessary to expel them. All that is required for this purpose, is to raise the edge of the plaster which is the nearest, and press behind the contained air, from the centre to the circumference. If a piece of plaster cannot be conveniently applied with accuracy to the skin, it

may be supplied by covering the affected spot with strips laid on one by one, and which, owing to their narrowness, easily follow the course of the part to which they are applied.

In whatever way the adhesive plaster be put on, we should first shave off the hairs, and wash and cleanse the skin with a piece of linen or a sponge steeped in fresh water; this very simple precaution is at times sufficient to do away with the unpleasant sensation of heat and itching generally experienced by the patient. The skin must then be wiped dry with care, moisture being likely to oppose the adhesion of the plaster.

Strips of Adhesive Plaster.—*Sparadraps*, employed to effect adhesion, are of frequent use. They are cut into the shape of strips, called agglutinative or adhesive. What has already been said about the difficulty of making large plasters adhere, is sufficient to set forth the advantage which there is in using the plaster-cloth cut into slips. The length and breadth of strips of plaster are proportional to the volume of the parts on which they are put, and to the extent of the solutions of continuity in the soft parts which it is intended to reunite. But it should always be recollected that their action is superficial, and affects only the skin; so that, although very serviceable in bringing about the adhesion of shallow wounds, and to keep the muscles of a stump in contact with the integuments which cover them, they do not suffice for the reunion of long and transverse wounds of much depth, and the uniting bandage, as it is called, should be substituted for them. When we come to the article on wounds, we shall see, however, that both these dressings may be combined, in cases where the muscles are only superficially concerned.

The number of strips which are employed, is in proportion to the extent of the wound whose edges they bring together. They are laid side by side, so as to allow the fluids to escape between their intervals, and facilitate the exchange of any one which may have ceased to adhere, without, in so doing, disturbing any of the others. This arrangement allows, if there be need, of our removing all the strips, without inflicting on the wound such disturbance as may tend to break a yet delicate cicatrix.

The more the length of a strip of plaster exceeds its width, and the greater it is, the more solidly it keeps the parts in contact. Generally, when intended for the limbs, they should be cut in such a way as to go all round them, whether the solution of continuity

be longitudinal, as in an incision for the ligature for a large vessel, or transverse, as is the surface of a stump. Therefore, their common length will be from ten to sixteen inches; the width need not exceed six or eight lines.

When a wound is of trifling extent, say an inch or an inch and a half, it may be kept together by a single strip; but it must then be cut in such a way as that, the ends being larger than the centre, they may represent two long triangles, truncated and having their summits towards each other. The greater size of the ends increases their tenacity, and the narrowing of the middle of the strip, laid over the centre of the wound, allows the fluids to escape by its angles.

Method of applying Strips of Plaster.—Before the strips are applied, the surface should be shaved and dried, and the wound cleansed properly over which they are to be put. The surgeon then carefully approximates the lips of the solution of continuity, with the flat of both hands extended. The wound being large, say for instance a stump, he begins to lay on his hands at some little distance from the edges of the division; then presses lightly and slowly, so as to bring the deep seated parts as nearly as possible into contact, at the same time that he covers them with integuments, sedulously guarding against giving pain, or doing harm. In this way, the radial edges of either hand come together in a parallel manner, and will contain between them the injured edges of the solution of parts. An assistant, having warmed the first strip, which he holds lightly by its ends, first applies one half on the integuments, passes over the wound, and fastens the other half by slight pressure with the flat of his fingers. In this manipulation, it is important that there be a perfect correspondence between the actions of the surgeon and of his assistant, so that their hands may never strike against each other in meeting, and that the adhesive strip may keep the parts together as the fingers of the surgeon are removed to make way for it. At the moment that the plaster passes over the wound, the surgeon ought to support, for the contact, that side to which the strip has not yet adhered, so that when allowed to recede, the parts may be in perfect co-aptation.

The first plaster must always be applied to the middle part of the wound. Then a second and a third are laid on either side of it, and others successively, until the angles of the wound are arrived at. The ligatures which are placed upon arteries, when any have re-

quired to be tied, are always brought out at that angle which is the lowest. Strips are not always placed perpendicularly, as we have had occasion to mention. They may be put on obliquely in different directions, according to the necessity pointed out by the extent, regularity, or irregularity of the wound. Here, as in so many other cases, it must depend on the judgment of the surgeon to decide upon the line of conduct best adapted to fulfil the indications he purposes to effect.

We must be cautious in the application of adhesive strips, that the degree of tension they create, whilst it suffices to prevent the recession of the edges, be not too considerable, owing to the inflammatory swelling which must follow. This advice is of still greater importance where bones are felt to project beneath the skin; for, in such a case, gangrene might ensue, from the constriction being too powerful.*

Adhesive strips are useful, besides, under different circumstances. First, they are beginning to be very valuable in the treatment of old ulcers. This treatment, the invention of Mr. Baynton, has for its object the approximation of the edges of the sore, and the favouring of the formation of a cicatrix of greater solidity because of less extent: to this we shall return when we treat of that disease. Secondly, they serve to close the openings in abscesses of a chronic nature, the wound in phlebotomy, that from the operations for empyema and the tapping of dropsies, &c.; in a word, every time that speedy cicatrization is required, and that we design to prevent the outward communication of a natural or accidental cavity. Thirdly, they are employed to support firmly different medicinal applications, or caustics.

Court Plaster is of very limited utility. Owing to the cleanliness of its use, and the little trouble it gives, it is better than any other means for protecting small excoriations, or slight wounds, particularly upon the face and hands. We cut off a piece the size of the wound, moisten it with saliva, and by laying it on the skin it adheres directly.

* To this remark it may be added, that in ligatures of arteries, the femoral in particular, the strips of adhesive plaster should be laid over the wound lightly, and exercise scarcely any traction, lest in the enfeebled state of the limb from impeded circulation, gangrene might follow even from this trifling pressure.—*Trans.*

Articles of Dressing which are proper in the treatment of Fractures.

Section I.—*Of Splints.*

Splints are long, thin and narrow pieces of wood, pasteboard or tin, which are employed with a view of keeping a limb absolutely immovable. They are most often used in cases of fractures of bone. Their employment however, is sometimes necessary for opposing the recurrence of a reduced dislocation, for preventing all motion after a sprain with laceration or violent distension of the fibrous tissues, after the rupture of a strong tendon, such as the ligament of the patella, tendo achillis, &c.; and lastly, to obviate the contraction which occurs in certain parts, the fingers for example, after severe burns.

Splints should generally be longer than the broken bone to which they are applied. For a given part, those whose end rests upon a fold created by a flexure, as at the inner and upper part of the thigh, or the bend of the arm, are shorter than those which are placed opposite to them on the other surface of the member. Almost all splints are straight in the direction of their length; although they are sometimes used curved at one end: of this kind is the *cubital* splint used in the Hotel Dieu at Paris, whose object it is to draw the radial edge towards the cubital edge of the hand, to avoid the riding of the fragments of a fracture of the inferior part of the radius. Other splints again are curved in the direction of their width, so as to form a groove or gutter; this shape, which corresponds accurately with that of the limbs which are received into the excavation, is of common occurrence. Splints of this kind are made of wood, of pasteboard, and of tin. They are more often used in England even than in France; and English surgeons keep a large assortment of this instrument of every dimension, so as to have them always ready, be the size of the fractured limb what it may. Those which are intended for fractures of the leg are perforated at their lower extremity, to receive the projections of the malleoli in case of need. Lastly, there are splints which are curved both in one direction and in the other. The two pasteboard splints recommended by M. Boyer, for confining the humero-cubital articulation, in cases of fracture of the lower end of the humerus, are of this class. I have myself successfully employed, in a fracture of the first phalanx of the great toe, a wooden splint, which lengthwise followed the undulations of the lower part of the metatarso-phalangeal articulation of the first toe and

of the great toe itself, beneath which it was applied, and made moreover a species of gutter adapted to the shape of the different transverse curves which are described by these parts.

Wooden splints generally do better in young persons and in adults, owing to the greater vigour with which their movements are capable of being exercised. They ought to be shaped according to the longitudinal direction of the fibres of the wood. The wood of which they are made ought to be a solid and hard species, for instance oak, elm, or mahogany, and it should previously be dried, that it may be less liable to warp after it is finished. Splints should likewise be as light and thin as the resistance they are called upon to make will allow. It is advisable to round off the angles in their length and at the ends, to prevent them from splintering, or their square edges from injuring any part upon which they may accidentally rest.

Long splints which go up as far as the crista ilii, such as are used in fractures of the os femoris, and particularly of its neck, have at each end a mortise and a slope; to some an iron guard is even given; these different forms serving to support the fillets for making continued extension and counter-extension. It is however impossible to enter, at this place, into details on this subject, which would lead us much beyond our present purpose.

Except a very few peculiar apparatuses, such as that of M. Dupuytren for fractures of the fibula, which has only one splint, these accidents generally require the use of several splints in their dressings, two for the fore-arm, two or three for the thigh and leg, and sometimes even four for the arm. They are of different lengths, according as they are placed upon a surface which corresponds with the bend or the extension, the adduction or abduction of the limb.

There is a species of splint, called *Pallet or Battledore*, which is a rude imitation of a hand with the fingers extended side by side: its particular use is to fasten the fingers when burnt, and so prevent the contraction consequent upon the loss of substance of the skin, and by keeping them apart, to avoid their mutual adhesion.

Pasteboard splints are particularly suited to children, and in some cases are used for adults. Previous to its application, this splint should be softened by being moistened. In this state, it moulds itself easily upon the limb, and takes each of its inflections; and as it hardens in drying, it becomes able to support it with very considerable firmness. Pasteboard, owing to this said property of moulding,

is of all other materials the most proper for maintaining in position a reduced fracture of the lower jaw. But it has its disadvantages, as well as its advantages; and owing to the great ease with which it softens, it cannot be employed where a wound is discharging, or when it requires to be cleansed by washing.

Tin splints are invariably used of a gutter shape. They have proved successful when used for complicated fractures, and the resection of the surface of a joint. But as this is a material not always at command, and as its general application has in it nothing peculiar, they are instruments but little used.

If it should so happen that we are called upon to dress a fractured limb in a place where there are no means of obtaining assistance, and are ourselves destitute of the common articles of dressing, it will be necessary to use, instead of a splint, the bark of a tree which is gutter-shaped, or flexible switches surrounded by linen or straw, which may be kept on by packthread, or a young twig of osier twisted spirally, and making that kind of splint formerly called "*true splint.*"

Of whatever substance splints be made, as they can be useful only when they afford a hard surface, capable of offering resistance, so their contact with the part is liable to inflame it; the integuments are therefore always protected either by compresses laid between them, and surrounding the limb without forming folds, when pasteboard is used; or else, when the splints are of wood, by cushions of lint or tow, beside the compresses and bandage in which the limb is already wrapped.

The Foot-board.—This is a small and light board, very thin, and cut to the dimensions of the foot. Upon its median part it is perforated by two vertical mortises. It is made use of in fractures of the lower limbs, in which cases it is wrapped in linen, and applied against the sole of the foot. A bandage is passed through the mortises, and includes the intermediate space by describing a loop around it. The tails are brought up in front, passing over both sides of the foot, on the fore-part of which they are crossed, and then secured by pins to the splint cloth which surrounds the splints. The foot-board, being thus rendered immovable, serves as a point of support for the foot.

In M. Boyer's mechanical contrivance for fractures of the cervix femoris, this foot-board is made of wrought iron, and being first fastened to the foot, obeys the action of a long screw, which moves

in the long outer splint, and thus, at pleasure, produces permanent extension.

Section II.—*Cushions.*

By this name, and that of pad, junk, or stuffed bag, is understood a bag made of transparent and worn linen, twelve or fifteen inches in length and three or four in width, which is filled with some soft and dry material, capable of yielding to motion, so that its bulk at certain points may be added to or diminished at will. These cushions are filled for the most part with chaff; which as it is in no wise hygrometric, and is easily pressed from one part of the bag to the other by the least effort, is, of all other substances, the best calculated for the purpose. Chaff not being procurable, cushions are filled with feathers, bran, millet, cotton, wool, hair, &c. but these three latter substances, consisting of adherent fibres, are with difficulty made to change their place; they are liable to the objection of gathering into hard and thick plugs, and likewise overheat the parts upon which they are applied. They had, therefore, better be dispensed with, unless other more appropriate means cannot be procured.

Cushions serve to protect fractured parts from painful contact with the splints. The ease with which chaff is displaced gives an opportunity for adapting the cushion to the form of the limb, increasing the quantity of the stuffing at points where there exists a depression, such as, in the leg, the parts above the malleoli; and on the contrary, taking from its thickness in the more prominent parts, as, to pursue our comparison, over the ankles themselves; in such a way that the splint may rest perfectly flat in its whole length, and never press upon the limb.

But, it is evident, that to be mobile enough, cushions must never be more than half stuffed; and the more difficult the material in the cushion is to circulate, the more this condition should be attended to.

Section III.—*The False Splint.*

By this term was meant, in ancient surgery, pieces of linen doubled lengthwise, in many folds, like a cravat, which were applied in place of cushions between the splints and the fractured limb. It is a means which may still be used when cushions cannot be procured, being careful to protect the depressed points with some soft body, such as cotton, linen, wool, lint, &c. Applied alone, they can

but imperfectly adapt themselves to smoothing the surface on which the splints are to lie.

Section IV.—*The Splint Cloth.*

This name has been given to a piece of linen which supports the splints with which it is intended to envelop the fractured lower extremity, and which, placed between the limb and the bed or pillows which support it, includes the whole apparatus when it is applied. The splint cloth is used for fractures of the leg and thigh. In the first case it is only as long as the leg, but in the second its length is equal to that of the entire lower limb, at least, in such apparatuses as keep the limb in a state of extension to obtain consolidation of the fracture. The splint cloth ought to be wide enough to go twice round the limb. When the bandages &c. have been applied, the two lateral splints are covered with the edges of the splint cloth before they are raised up. For this purpose the splints are laid flatwise, and perpendicularly to the length of the limb, leaving only such a space as may be judged necessary for admitting of the thickness of the cushion; the splint is then brought towards the operator by turning it over on itself, with a rotatory movement, quite to the edge of the splint cloth, that we may calculate how many times the cloth is to fold over it from the starting point. An assistant on the opposite side of the limb does the same with the other splint. The edges of the cloth are then folded over the splints, which are rolled up in it by recommencing the same rotatory movement up to the place whence we had before set out. When there, the splints are raised up on either side, on their edges, and all that remains is to apply the pads and the fastenings.

Section V.—*Fillets and Tapes.*

These are of many sorts. Tape is made of hemp, or of raw or unbleached flax, and is about an inch wide. It is made use of to tie up a fracture apparatus for the lower extremity, and for keeping the splints and cushions in their places: and often also to fasten the foot-board to the splint cloth. The length of these tapes must be sufficient to go quite round the apparatus and tie easily in a double bow; but it varies necessarily with the size of the limb: usually it is about three feet. The tapes are placed at a distance of five inches apart, or thereabouts. For the leg, we put three; five in the dress-

ing of a fractured thigh, in which the whole limb is included in the apparatus.

The word *fillet* (*lac*) has a much wider signification, for it applies both to the tapes of which we have spoken, and to ties of all sorts. The most important are those used in reducing dislocations. These are, according to the degree of resistance to be overcome, sheets or napkins folded cravat-wise, which are fastened upon the ends of limbs, to overcome the force offered by the parts to be replaced.

We shall here rest satisfied with the establishment of this cursory distinction as to the use of *lacs;* as it is not a proper place for a more detailed consideration of the subject.

OF THINGS WHICH ARE EMPLOYED IN ALL DRESSINGS.

SECTION I.—*The Bed.*

The bed of the patient should, as much as possible, be a narrow one, so that the surgeon and his assistants, standing on different sides, may easily reach the centre. When a bed is too wide, it is not easy for the assistants to maintain for any length of time the necessary positions for effecting the dressings, without suffering exceedingly from fatigue of the muscles of the back. The bed, besides, should be so high as to avoid the necessity of much stooping. The mattresses should be solid enough not to give beneath the patient, forming hollows underneath him, the sides of which often press against the dressings or the injured part. The bed should be surrounded with thick and wide curtains, which during the dressing ought to envelop the surgeon and his aids. This arrangement is very important; the patient when he is uncovered should be isolated as much as possible from the cold atmosphere and currents of air which pervade the chamber, or the wards of an hospital. Lastly, when the injury is serious, and particularly in fractures of the lower extremities, it is well to have a rope, fastened above to the tester of the bedstead or ceiling of the apartment, which comes down within the reach of the patient. To the rope is attached a handle which he uses in changing his position, to assist us in applying the dressings, and in satisfying his natural wants.

SECTION II.—*Different things needful.*

There are, besides, things of general utility which come into play more or less in every dressing. Such are lights, when that of the

day is insufficient; bowls or basins to hold the different remedies, or to receive the portions of lint &c. as they are taken from the wound; sponges and vases of warm and cold water for moistening the dressings and cleansing the parts; and soft and dry rags and linens for wiping them.

THE GENERAL EMPLOYMENT OF DRESSINGS.

Having thus enumerated and described the various things which are used for dressing, we are now to consider how their application is to be proceeded in.

The manner of dressing a wound, or other accident, varies according to the indications which we are required to fulfil. These indications are drawn from the seat and extent of the wound, from the nature of the parts concerned, the depth of the division, the state of the disease itself, the complications which exist or may occur, such as the presence of foreign bodies, fluids to be evacuated, threatening of hæmorrhage, atony or gangrene, the constitution of the patient, &c., all of which circumstances compel us to alter materially our plan of treating a solution of continuity. We shall say a few words however, upon the general order in which the articles of a dressing are employed.

ORDER IN WHICH DRESSINGS ARE APPLIED.

We begin by using sponges to wash and dry the wound; then if we heal it up by the first intention, we apply our adhesive strips with the care and precaution we have elsewhere detailed. If the wound is deep, instead of adhesive strips, we place on either side of it a graduated compress of equal length with itself, and secure them by an apparatus, which at a later period we shall describe. If the wound may not be immediately re-united, in cases for instance, where great loss of substance exists in a place at which the skin, adhering firmly to the subjacent tissues, is tense and will not allow of an approximation of the edges of the incision; in such a case, I repeat, we are to cover the outline of the wound with the slit strips of linen before mentioned, the incisions in which describe the circumference furthest from the centre of the solution of continuity; or else, we lay a perforated compress spread with cerate over its entire length.

The dressings being pursued to one of the three stages now described, we lay on our cushion of lint, and cover the latter with small flakes of lint laid in heaps, if it be presumed that the wound will dis-

charge profusely. Above the cushions and lint, are placed the compresses. If the wound be on the side of a limb, we apply first a compress folded in four flatwise; this is kept on by a couple of others which envelop the whole, and these are again retained by a few circular turns of a bandage. If, on the contrary, we are dressing a stump, we begin by placing an elongated compress on either side, which for greater security is obliquely directed so as to collect the lint towards the centre; the ends of these compresses advance for some inches, and cross one another on the two opposite surfaces of the limb; their correspondent edges are covered by a third elongated compress applied to the middle of the stump; a fourth, placed circularly, keeps up the ends of the first three, and the whole is wrapped up by a roller bandage of one head, so applied as to form a kind of cap for the stump.

GENERAL RULES FOR DRESSING.

All dressings are subjected to general rules which it is well to know, and which had better be departed from as little and as seldom as possible.

Before they are commenced, the surgeon should himself prepare or superintend the preparation of all that is to be used in the progress of his duty, and indeed of the performance of any operation whatever. He is to cause each article to be placed in the order in which he is to use it; he will station his assistants, and assign to each the part he is to act.

The diseased part is always to be in a strong light, and, as far as possible, isolated and easy of access; which, by a suitable position, may in most cases be contrived. This is a necessary step to guard against unintentional injury, slowness, and all the little vexations which result from the surgeon being inconvenienced in his movements. The operator is to stand at the side of the wound; his own position, and that of the aids and the patient, should be so comfortable, as that they may be kept without fatigue during the whole continuance of the dressing. Unless in cases where it is necessary to make pressure, as when hæmorrhage is dreaded, all parts of the apparatus should be lightly applied; and this is particularly obligatory on a first application, owing to the inflammatory swelling which must ensue, and in general, where it is much to be apprehended. Care should be taken not to leave the wound too long exposed to the air, which dries and irritates its surface; and likewise to cleanse it

of the blood which covers it, particularly when it is subsequent to the first dressing, and owing either to some little rudeness done to a part, or to any other cause; experience having proved that this fluid gives to wounds an unhealthy aspect, and impedes their cicatrization when they are suppurating. Lastly, we must always be careful to keep the wound and the dressings strictly clean, and also the bed, which must be protected by guards; and for the dressings, linens which have been bleached in lye and are free from any bad smell, only should be used. As soon as the dressing is finished, we are carefully to place the patient and the wounded part in as convenient a position as possible, and protect the latter from all pressure which might create uneasiness.

In all that concerns the manipulations of the surgeon himself, the old aphorism must be recollected, which advises that all operations be done with speed and security, and with as little pain as may be. It is essential to accustom oneself early to acquire that certainty, mildness, and quickness, which enable a skilful operator to manipulate with ease and elegance in every direction about a part diseased and highly sensitive, without ever giving needless trouble, or causing unnecessary suffering. Although rapidity and lightness of hand can be obtained no where so completely as by frequent practice upon the patients in large hospitals, those who reside at a distance from them, may, in a great measure, supply this want, and prepare themselves for acting with readiness upon the sick, by the frequent and careful application of bandages either upon themselves, upon manikins, or, what is still better, upon some one willing to offer the use of his limbs for this purpose; this latter means being commonly practised, and with success, where several pupils are studying together.

THE APPLICATION OF THE PRIMARY DRESSING.

The primary dressing is that which is first applied to a recent wound. It is that of all others, to which it is indispensable to give the utmost attention. The necessary cleanliness having been observed, and blood no longer flowing from the wound, the first step to be taken, when union by the first intention is to be practised, is to collect together the ligatures in a bundle. To lessen its bulk, one end of each thread is cut off near the tied vessel, and the other left out of the wound. We surround this fasciculus with a small piece of linen, and keep it adherent to one edge of the division by a

strip of adhesive plaster, lest it might stick to some part of the other dressings. But for this act we incur the risk, on a renewal of these dressings, of loosening the ligatures, or at least of disturbing them by traction, in which case hæmorrhage might recur. The spot selected for bringing out the ligatures is generally the depending angle of the wound; but if the bulk of the assembled strings is too great owing to their number, they must be divided into separate bundles, and brought out between the adhesive strips.

When there exists any very considerable loss of substance, which forbids immediate union, we are advised in France to cut both ends of the ligature off near the knots, the bottom of the wound being always clearly in view. English surgeons do not confine the section of both strings at the place of ligature, to cases only in which immediate adhesion cannot be effected; some, on the contrary, follow the precepts of their countryman, Mr. Lawrence, who, if the case admits of it, unites the wound as usual, giving himself no anxiety about the threads left in it. In fact, as he cuts his threads very near the knot, they take up very little room; being made of silk, not exceeding in weight the one twentieth of a grain when placed as ligatures upon the largest artery, and not going beyond the one twenty fourth of a grain when applied to the smallest ones.

According to Mr. Lawrence's statement, these ligatures usually create no inconvenience. The attempt has succeeded with several surgeons in England, and with M. M. Roux and Delpech in France. Nevertheless it is to be feared in all such cases, that in their expulsion outwardly, the threads may give rise to small abscesses, as has happened to Mr. Guthrie, M. Dupuytren at the Hotel Dieu of Paris, and, as Mr. S. Cooper states, he has also seen to occur. The old practice then, of cutting both ends of the ligature only when the wound is not immediately to be closed up, seems after all to be the best.

We have said that the first dressing must always be applied lightly, and the various pieces which compose it not be tightened, owing to the swelling which must attend the inflammation that is to follow. If, after adopting this precaution, the swelling is so great as to cause acute pain in the seat of injury, it is better to remove the bandages and compresses, and to reapply them, than to incur the risk of having accidents happen. But before the patient is subjected to all the annoyance attendant upon a new dressing, and to derangements which in themselves may be serious from the excessive reaction

which occurs when pressure is at once removed from a wound, it is better to try cutting across some turns of the bandage which supports the apparatus; the relaxation from which will often put an end to the symptoms.

The pain will often last in nervous subjects, although the dressing nowhere compresses them; in such cases, the cloths, &c. must be steeped in mucilaginous decoctions, such as marshmallow root or flax seed, rendered slightly anodyne by a mixture of poppy capsules, or belladonna leaves.

Bleeding is another occurrence often to be apprehended from a recent wound. We should be able to distinguish that which comes from disengorgement of the capillary vessels, and from the cessation of the state of spasmodic contraction which these vessels undergo at the time of their transection, from that sanguineous discharge which follows the slipping off of a ligature, or which would flow from the mouth of a divided arterial branch to which no ligature had been applied. Under the head of Hæmorrhage, we shall consider these occurrences, and the means of treating them, at much length.

Nothing happening to compel us to remove the primary dressings, they are not to be touched, in wounds in which suppuration is required, until it begins; nor until a period still more distant in those which are intended to be united by the first intention.

THE REMOVAL OF THE PRIMARY DRESSING.

A variety of circumstances influences the period at which suppuration commences. It occurs rather earlier in summer than in winter; in a child or in a robust adult, sooner than in an aged or enfeebled individual. It is influenced also by the nature of the parts concerned in the lesion: those which are naturally endowed with acute sensibility, or which possess an abundance of cellular tissue, suppurate more quickly and in greater profusion than those placed in opposite conditions; the same is observable in solutions occurring in old or newly formed parts, in regard to recent wounds throughout their whole extent. It is proper also to state, that in consequence of a difference in the mode of vitality between the tissues, there exists a singular difference in the intensity and term of their inflammations. These peculiar phenomena concerning wounds are not, however, generally noticed, and exercise a scarcely appreciable influence over the *ensemble* of the cure; the term suppuration being used chiefly for those tissues gifted with the most vitality, such

for example as the skin, muscles and cellular membrane, which usually constitute nearly the entire surface of a wound.

Suppuration is not generally established before the fourth or fifth day. Before the different pieces of a dressing are taken off, they must be steeped in some emollient solution, or in warm water only, to detach them the more readily. If, owing to the desiccation of the fluids which for several days have oozed from the wound, the compresses, &c. are matted into a hard and firmly adherent mass, it would be well to keep them moistened for an hour or two beforehand, to soften them, that they may be the easier removed, without exposing the wound to tractions which are always painful, and sometimes even dangerous.

All the things needed in removing the old, and in re-applying the new dressings, being laid ready at hand, the surgeon, having placed the patient and wounded part in the position adopted for the first application, gives the limb to be held by his assistant, who is to support it on the palms of either hand, making no pressure upon it, particularly with the tips of his fingers. The surgeon next gently unrolls the bandages, avoiding too great haste, which if he should find himself suddenly stopped by an agglutinated part, would be the means of giving a rude shock to the patient. As the bandage is undone, he gathers it into his hands in a bundle, passing it alternately from one to the other, preventing any of its loops from dragging upon the ground, which might inconvenience him by catching in some adjacent body. If, notwithstanding he has moistened the whole dressing, the deeper seated circular turns are still too adherent, they are to be wetted anew with a sponge dipped in warm water, rather than to be pulled on with any strength, for by this it might happen that, the adhesion giving way suddenly, the hand passing abruptly to one side might inflict a violent blow on the limb.

The bandage being entirely removed, the compresses are one by one gently detached, by supporting them underneath with the flat of the left hand, that they may not carry away with them at once all the lint which covers the wound, if they should happen to fall. When the layer of lint is thick, the upper strata are removed with the fingers or the dressing forceps; but, as we approach the surface of the wound, we try with the forceps, obliquely directed, gently to detach the filaments; if found to adhere too considerably, the free ends are cut off with scissors, and the rest left to fall off by

suppuration at a future dressing; whereas, if force had been used to remove them, we should have made the part of the wound bleed to which they stuck, and have run the risk of disturbing any ligature which might be near by, besides the inconvenience, a great one in all cases, of uselessly prolonging the operation..

CONSECUTIVE DRESSINGS.

The old apparatus being removed, we must hasten to apply the fresh one. In this dressing, as in those which follow, the precautions heretofore detailed are to be observed. Of these, one of the most important is never to leave the wound exposed to the access of air. The suppression of suppuration which may ensue, is frequently attended with rigors which are the precursors of some visceral inflammation; not as was taught in ancient surgery, because the pus itself is carried from the wound to the lungs, pleura, &c.; but if the explanation of the phenomenon be not the metastasis of matter, it occurs at least by some sympathetic irritation whose cause we are in truth unacquainted with, but the effects of which are notwithstanding as evident and certain.

When suppurating wounds are of great extent, and we are in places crowded with the sick, and in an atmosphere loaded with deleterious miasms, they are to be considered as absorbing surfaces, and hence the additional danger which attends their exposure may be readily conceived. Indeed, during the whole time consumed by the dressing, we must take care that the patient be suitably covered, and that no draught of air in the chamber, blows upon him; we must not dress him whilst in a state of perspiration, and in every case, only those parts of the body are to be uncovered, which it is absolutely indispensable to denude for the re-application of the dressings.

As it is a matter of much moment to avoid fatiguing a patient during dressings on the body and affected parts, the position he is to assume is important; it is proper to consult him on the subject, in most cases, whether he is strong enough himself to support or present the part injured, or whether this duty must be entrusted to assistants. If, in consequence of the seat of injury, we are obliged to place the patient in a position which he of himself cannot easily maintain, the unsupported parts must be propped up by pillows, or he be conveniently upheld by two assistants, in their arms, if a mere inclination to one side is necessary, or else, by passing the ends of folded sheets

or napkins beneath the shoulders, belly or loins, when it is necessary to elevate him, or to make him lie on one or other surface of his body, in a more or less inclined position. Such inclinations of the person are particularly useful in very feeble people, and in facilitating the dressing of certain wounds of lateral and posterior parts of the trunk, especially gangrenous sloughs on the sacrum. In every case, having once commenced the operation of dressing, the position of the patient is no more to be changed or altered, unless at the request of the surgeon himself.

THE POSITION DURING THE INTERVALS BETWEEN EACH DRESSING.

When a dressing is over, it is essential to give the body generally, and the diseased parts in particular, that situation which shall most conduce to recovery.

Situation conduces in a two fold way to convalescence; first, by favoring the escape of fluids as fast as they are secreted, or reach the surface of the wound by fistulous passages; and secondly, as it puts the parts in the most favorable relations for healing.

To effect the first of these objects, position must be calculated in such a way as that the bottom of the abscess, &c. shall be higher than its orifice, so that matter may never accumulate in it. For this purpose, the patient is sometimes required to assume attitudes and inclinations the most varied, depending on the wounds being in the trunk or limbs, anteriorly or posteriorly, or on either side. When the posture required would be too inconvenient, or liable to objections, we are compelled to favour the exit of the fluids by filling the cavities with fine lint, which both by absorption and capillary attraction, causes the pus to mount contrary to gravity from fundus to surface, where it soaks into the apparatus.

That position which has for its aim the facilitation of adhesion, ought always to be such as that the parts are kept relaxed, and tend, so to speak, to reunite of themselves. We usually experience the feeling of the most perfect comfort and calmness, in a state of semi-flexion; and this is the position which mankind mechanically assume in reposing from fatigue, and that also, which is observed during sleep. This situation, apparently so natural, is extremely proper in surgical affections also, unless specially contra-indicated, as when, for instance, a cross wound exists on that surface of a limb which corresponds with the direction of its extension Moreover,

the diseased part should be kept upon a plane somewhat higher than those which are nearest the trunk, to guard against the risk of venous or lymphatic congestions. This may be done by semiflexing the limb and laying it upon a pillow, protected by a cloth and supported at its free end by a cushion, so as to form an inclined plane. We must, besides, not only avoid laying the limb on the side where the wound is, but also any pressure or inconvenience to the latter, by removing every thing capable of effecting it. To succeed in this object, different means have been devised. If the mattress gives uneasiness at any one point, it is depressed, or the stuffing is removed at the corresponding part, so as to create a cavity; if it is the pillow which is uncomfortable, it is to be pressed down. Where the wound is so situated that it is nearly impossible to avoid its being compressed, a slough on the sacrum for example, we are to hollow out a cavity in the mattress, in which a circular rim is made to enter, and is so placed that its central hole corresponds with the ulceration, which is thus relieved from pressure. If the weight of the bed clothes is annoying, they are upheld by two semicircular hoops (spiders), which rest on the mattress on either side. After all, it must be confessed that art is insufficient in many diseases to obviate the difficulty created by the pressure of the parts themselves; an instance of which is afforded us, as an illustration, in those cases of vast phlegmonous erysipelas which envelop the whole circumference of the abdominal members.*

When the diseased part has been placed in the situation most conducive to its recovery, that situation must as long as possible be persevered in. As, however, every attitude, and even that which was found at first to be the most comfortable, becomes speedily tiresome, and gives rise to unpleasant symptoms, such as general pain, and stiffness of the joints, subsultus tendinum, and above all the gangrenous sloughs, in those parts which act as fulcra to the body, it is very uncommon to be able to go on to the end of a treatment of any length, without being compelled to change the position. Cases of fracture especially make it necessary. In the greater number some slight modification in the position of the patient can be effected, and

* In such cases, Dr. Arnott's hydrostatic bed will afford an invaluable auxiliary to the surgeon, and prove most comforting to the patient. This is described at length, in the 5th London edition of his Elements of Physics, and an abridged account will be found in Vol. II. Lancet, Sept. 1831. p. 746. —*Trans.*

when a certain time has elapsed, he may be allowed to make such feeble movements for his relief, as will put a stop to the muscular twitchings, and lessen the stiffness in the articulations; but there are lesions, fracture of the rotula for instance, and that of the olecranon, os calcis, &c. a rupture of the tendo achillis, ligamentum patellæ, wounds crosswise of the muscles, and the like, which do not allow of the slightest motion previously to their perfect consolidation. In such cases, we must resort to anodynes and mucilaginous fomentations to allay the pain, and guard against the formation of sloughs by every means heretofore indicated.

The necessity which exists of confining the patient to one posture for a long while, and of subjecting him to move as seldom as possible, together with the difficulty which there is in observing this precept, and of satisfying the different wants of the sick at the same time, as well as of allowing the surgeon daily to attend to the dressing of his wounds, or ulcers, has given rise to the invention of several beds, calculated to meet this exigency.

MM. Daujon and Delpech in France, and Mr. Earle in England, have turned their attention towards improving these beds, so as to render them as convenient as possible for the patient.

The bed used in the Parisian hospitals consists of a frame of wood provided with girths, which are laid upon the upper mattress of a common bed. Each girth may be removed singly, at least as it regards the anus and wounds or ulcers situated on the posterior surface of the trunk. Four pullies are fastened inside of each angle of the bed, at the upper part of the vertical uprights. On the outside, either at the head or foot, are two other pullies; to which a roller corresponds below. Four ropes are attached to the angles of the wooden frame, and are reflected over the pullies. Those at the end to which the roller is fixed move directly around it; the ropes of the opposite end, having passed over their pullies, extend all along the bed, and slip anew into the groove of the pullies placed outside the crosspiece; whence they turn downwards and go to the roller. By turning the crank of this roller, the wooden frame on which the sick person lies is elevated, and it is manifest, that by merely previously shortening the ropes at one end or one side of the bed, we may change his position in any direction we please. To prevent the frame from re-descending, the roller is provided with a cog-wheel at one end, between whose teeth a catch falls; so that the apparatus is held at the required elevation.

The four uprights of the couch may be replaced by four supports joined by cross pieces, or by attaching the pullies to the ceiling.

This bed is covered with sheets or cloths, in parts where there must be no wrinkles, and the patient, covered with the bed clothes, is placed upon it. Without occasioning him the least inconvenience, we are enabled, by means of this apparatus, to raise or incline his body at will, to pass a vessel under the pelvis for the reception of discharges, and to dress all wounds and ulcerations situated on the posterior and lateral surfaces of the trunk.

OF ATTENTION TO CLEANLINESS.

Attention to cleanliness, though always indispensable, is the more obligatory upon us when wounds are freely discharging fetid pus. By a careful removal of the guards, &c., and their re-application, we shall protect the patient from the infection generated by miasmata. But it is amid a crowd of sick, some of whom are labouring under hospital gangrene, carbuncle, or malignant pustule, that the surgeon must redouble his vigilance; and with his attention to cleanliness, combine the resources of hygeia, and the use of the most active disinfecting agents of the materia medica.

Still, in common cases, an extraordinary degree of cleanliness, without being as bad as a contrary fault, however, has its objections. Thus, it were wrong to remove at every dressing, all the pus which covers the surface of a wound; for the layer which this material makes, when unctuous and laudable, is a softer sheath for the parts than the softest lint. A worse practice still, is that of making repeated lotions to the surface of wounds; experience having demonstrated that this inconsiderate washing soon induces a grey colour in granulations previously of the most healthy aspect, and that it retards the healing of the wound by the irritation and desiccation which the contact of air and of the instruments causes upon its surface, and by the too frequent removal of the pellicle, observed in incipient cicatrization.

OF THE INTERVALS BETWEEN THE DRESSINGS.

The lapse of time which it is proper to allow between dressings, varies according to a number of circumstances, the principal of which depend upon the nature of the disease, the quantity of suppuration, condition of the wound, species of remedy used, and state of the atmosphere, &c.

To re-apply dressings too frequently, is to interfere with the labours of nature; to irritate the wound, and to cause lacerations which retard the formation of the cicatrix; to render nugatory the action of topical applications; to fatigue the patient unnecessarily; and to create even, sometimes, by the very effect of such reiterated irritation and the pain to which it gives rise, an increase of systematic irritability which may be attended with the most unpleasant consequences. By making them too seldom, on the other hand, we allow time for pus to accumulate in too large quantities. This material, when retained, causes foci and sinuses; if there be remedies topically applied, it alters their properties, or may effect their decomposition; it becomes of itself altered speedily in character, particularly in hot weather, grows fetid, and if in this condition it happens to be absorbed, is known to give rise to diseases of a dangerous character.

Generally a solution of continuity may remain untouched for twenty-four hours. This time is usually sufficient to allow the dressings to imbibe the pus without its passing through them, and without giving an opportunity for any unpleasant change of properties.

When, however, the weather is extremely warm and moist, pus becoming at such seasons the most speedily fetid, it is often useful to dress the wound every twelve hours. There are cases again, in which they must be renewed oftener than this; as for example, when suppuration is extremely abundant, when wounds and ulcers become gangrenous, or assume the hospital mortification, when infectious or irritating fluids, such as urine or fœcal matters are poured upon their surfaces, or when the effect of our dressings is promoted by medicinal lotions or applications which it is proper to repeat.

Dressings, on the contrary, must be infrequent, and at intervals of two, three, or even more days, when hæmorrhage is apprehended on the removal of the apparatus, where wounds pour forth but little or no pus at all, when the parts in order to their recovery, require only to be kept at an uniform and mild temperature, and to be preserved from contact with external substances. Simple wounds, of small extent, heal even quicker for not being touched after a first well effected dressing, than when they are irritated by untimely attention to renew the apparatus oftener than is necessary.

Fractures always require fewer applications than wounds, unless

the two injuries be combined in one patient. In general several days are allowed to elapse between the dressings in these cases. There can be no need for renewing them, unless by slackening they no longer properly support the fractured ends of the bone, or there occurs a sensation of pain and uncomfort, or a pruritus of the skin, owing to the unequal pressure exercised by the separate parts of the apparatus. So long as the patient nowhere complains of weariness, and the fracture is solidly kept in apposition, we must wait. For let it ever be remembered, that for obtaining consolidation of a fracture, the most entire tranquillity is absolutely indispensable; and that every motion not imperiously called for by the necessities of the treatment is a serious error, inasmuch as it may jeopardize, or uselessly prolong the cure.

Wounds, &c., are usually dressed in the morning. When two dressings are performed, the second is done at night. A necessity for the dressing manifests itself in the patient, by inconvenient itching, and sometimes by pain and irritation in the wound. A well made dressing, on the contrary, leaves behind it a feeling of comfort; a circumstance which has induced some surgeons to doubt whether it be not better, when one dressing only is required, to leave that till night, to assure the patient of a more tranquil repose.

OF THE INDICATIONS WHICH ARE ANSWERED WITH DRESSINGS.

These are the protection of parts, to keep them in union, to separate, compress, or support them. To bandages which produce these different effects technical names have been given, analogous to the objects for which they are intended. Accordingly, we have *uniting*, *dividing*, *compressing*, *suspensory* bandages, &c. That called the *contentive* is used only for preserving parts from contact with exterior agents. The word in this case applies only to the bandage which retains the other pieces of the apparatus in place; and inasmuch as it has in it nothing special, is an insignificant denomination. All bandages are necessarily contentive, even when designated by some other name, besides which it is absurd to found an appellation on the existence of an effect the production of which is inevitable.

OF REUNION.

Reunion is that part of a dressing which has for its aim the retaining of approximated parts. It is of use in all simple wounds, in which, the disease not being complicated, the cure should be forth-

with completed. Loss of substance is not a contra-indication to its being employed. Wounds which are very much bruised or lacerated, do not admit of reunion; nor do those which require the extraction of foreign bodies which have escaped notice, or which give exit to fluids which might accumulate in an abscess if their expulsion were impeded. The means of effecting reunion, are position, compression, adhesive strips, sutures, and uniting bandages. We have, in a general way, observed that position consists in placing parts in the most complete state of relaxation possible. Nothing special can however be said about it except by treating of particular wounds, owing to the difference in their seats. Adhesive strips, and the method of using them we have already described, and all that relates to suture and uniting bandages we postpone to a future section. It now remains for us to speak of compression and its effects, of which in the following page we shall say some words. But first—

OF SEPARATION.

In order to keep separate the lips of a wound, it is, in a majority of cases, only necessary not to place them in apposition; but it is also often requisite, to oppose the natural efforts for this purpose by the interposition of foreign bodies. Tents and pledgets are the more common articles for producing separation. They are introduced when there are fluids to be evacuated, either blood or pus, or foreign liquids which are escaping by a fistulous passage which it is advisable to keep open until their route through the proper channel can be resumed. Cushions of lint also are placed on the surface even of wounds which they keep apart, whilst we await the elimination of sloughs which may have been formed by gangrenous ulceration. Balls of lint and the tampon, in cases of hæmorrhage, at the same time that they are agents of compression, serve to induce a separation of parts. Lastly, divider bandages, aided by the unnatural position which the parts are compelled to assume by splints and bands, serve to prevent the contraction, which but for their use, follows the healing of extensive burns.

OF COMPRESSION.

To treat, in a detailed manner, of the method of making the different species of compressing bandages, of their mode of action, and the cases in which they are beneficial or injurious, would be almost to undertake a complete history of surgical therapeutics, for com-

pression is resorted to in so many diseases, that scarcely does a case occur in which it may not be employed, either as a prophylactic, palliative, or curative means. We must confine ourselves, therefore, to the more general indications in respect to it.

Compression is made use of, first to arrest or impede sanguineous discharge in many operations, in hæmorrhagy, and in aneurisms; secondly, as a means of obtunding sensibility; thirdly, to re-approximate parts, to prevent stasis or accumulation of pus or other fluids, and to favour adhesion. This application is of more frequent occurrence than any of the others; and is resorted to when there exists a loss of substance, or a cavity, as a cyst, abscess, sinus, a detachment of integuments, a fistula, &c., in all of which diseases, union can only be effected by placing the walls of the aperture in contact; fourthly, as a means of opposing venous engorgements or lymphatic congestion after some of the chronic phlegmasiæ, and particularly in the atonia of old people. The diseases coming oftenest under this head, are wounds, callous ulcers, wide and recent cicatrices, varicose veins, sprains, &c. Fifthly, for facilitating the absorption of effused or infiltrated fluids, as in cases of œdema, ecchymosis, hydrarthrosis, and from serous, synovial, and even purulent cysts. Sixthly, to lessen the energy of muscular contraction in fractures, ruptures of tendons, and cross wounds in muscles. Seventhly, for resisting the re-escape of a reduced dislocation. Eighthly, to prevent the descent of intestine by a hernial aperture, or to assist in its re-ascent when hernia exists. Ninthly, for producing atrophia and diminution of size in certain parts, of which mode of treatment, cancerous, aneurismatic, and erectile tumors, callosity, ulcers and fungous growths, &c. afford us an illustration.

The manner of effecting compression differs according to the end which we propose to ourselves, to the nature of the disease to be contended with, and the differences in the form and size of the parts to which we apply it. For either it must be made at, or confined to one point only, or it must be stretched over a surface of greater or less dimension.

When compression is made use of at one spot only, it is brought about by means of the fingers, cushions, or balls of rolled lint, by graduated compresses kept on by bandages, &c. Under this kind of compression, when used to arrest the course of the blood, are ranked the screw and field or stick tourniquets, and compressors, to be spoken of in the article on hæmorrhage. The diseases in which limited

compression is employed, are chiefly herniæ, hæmorrhage, aneurisms, cysts, trifling detachments of the skin, and fistulæ.

Although very circumscribed pressure has the advantage of inconveniencing only a small number of parts, the force with which it requires to be made necessarily gives rise to unpleasant symptoms, in a multitude of cases. Accordingly there occurs acute pain, congestion, coldness of the limbs below the ligature, when it is necessary to interrupt the circulation in the principal artery of the member, by which the veins and nerves are included of necessity in the compression. In all other cases, irritation, inflammation, and even mortification of the skin and sub-cutaneous cellular tissue, are the inevitable consequences of long continued pressure.

Extended compression is that which we generally exercise when we design to limit infiltration and congestion, to support fractures, overcome muscular contraction, to retain large herniæ and extensive tegumentary detachment. The bandages which unite wounds are also agents of this kind of compression. The advantages offered by the method are not outweighed by numerous objections, as is the case with limited compression; the reasons for which it is applied are not such as to call for as great power in the pressure, and the extent of surface allows of its being more gradually and evenly effected. In certain cases, however, when regard has not been had to the inflammatory swelling which is to follow, the stricture and strangulation caused by a dressing which was applied at first with moderate tightness, has sufficed for inducing gangrene of a whole limb. Fractures have many times offered examples of this occurrence.

Splints, and cushions kept on by fillets, and large single or double headed rollers, are the means generally employed for effecting extended compression on a large surface. The ease with which the reversed folds permit of their being accurately adapted to the most irregular superficies, allows of the modification of bandages according to size and shape of parts almost ad infinitum.

Compression, as it respects the axis of the parts, is lateral, circular, or direct.

Lateral Compression is that which bears upon some point in the circumference of a part without pressing as much upon any other. Its particular characteristic is, that it affects a direction parallel to the parts intended to be compressed; and it is caused by means similar to those used for producing pressure upon a single spot. Its

principal service is to effect the adhesion of the unextensive parietes, either of a fistulous passage which we desire to heal, or of an artery which it is intended to obliterate; or thirdly, when confined to arteries in particular, lateral compression is made use of when we desire only momentarily to slacken or intercept the flow of blood. For the exact approximation of the parietes, so as to obtain these two ends, it is required that the pressure which is made on the circumference should encounter a point of support at the centre. This latter is in the limbs the principal bone, and in other parts any osseous surface whatever. Compression is always more sure when the bone has between it and the surface a small extent of soft parts, and when this thickness is too great, cannot be effected at all. When an obliteration is aimed at, we are first carefully to investigate the course which the fistula or artery takes: for according to its direction will the pressure be applied. But to effect adhesion, presupposes inflammation; and such pressure as is capable of inducing a deep seated inflammation, is frequently followed by the conversion of the integuments on which it rests into eschars. For arteries, then, it is a means but little to be depended on; it does better for fistulous canals, the sides of which may be inflamed by mechanical irritation and injection, before the pressure which is to cause the adhesion is employed.

In order to convey an idea of the manner in which lateral compression may be effected, let us suppose that we are desirous of curing a fistula, or detachment of integument, midway in the thigh, and in a direction parallel to the axis of that limb. We take a graduated compress of equal length with the solution of continuity; and if the detachment be of equal depth throughout, the thickness of the compress must be uniform. It is usual to incise such detachments in the direction of their length, to favour their adhesion; if so, we place a small graduated compress parallelly on each side of the division. If, on the contrary, the depths be different, as in cases of fistula, for instance, which originating in a diseased femur, comes from centre to circumference, and opens on the skin, the graduated compress should then be thicker at the deep part, and diminish successively up to the aperture. This compress is secured by an elongated one, and a few turns of a roller. It is evident, that in this case, notwithstanding that the circular turns of the bandage are transverse as it respects the length of the fistulous canal or detachment, the compression is simply parallel, or longitudinal; being effected only by a graduated

compress, the thickness of which, projecting on the surface of the limb, prevents all pressure upon other points.

Direct Compression acts upon parts perpendicularly, and, as were, by crowding them back. It is useful in hæmorrhage, or to resist the growth of fungous excrescences on the surfaces of wounds. To effect this pressure, we make use of little balls laid directly upon the orifices of vessels which are discharging blood; these are kept on by the fingers, and other balls of a pyramidal form, whose base is outwardly, are heaped up in front and secured in the usual way.

This compression is painful, and is extremely irritating to a wound, and not to be relied upon; the soft parts sink under the pressure, and the loosened dressing then performs only imperfectly the duties which are assigned to it.

Circular Compression is of more general use. It is practised with large or small, single or double headed roller bandages. The width and length of these bandages, are proportionate to the size and extent of surface of the parts upon which the pressure is to act, the reversed folds enabling us to take hold readily of the irregularities of surface of limbs and joints.

From the simple circular turns, whose object is only to retain the dressings upon a slight wound, up to the most extensive spiral bandages, circular pressure is susceptible of infinite alteration, and is of use in cases the most diverse; for facilitating absorption—for preventing many kinds of congestion—for keeping fractures, luxations, and the diastases or separations between bone, immovable—for maintaining parts in apposition, such as cross wounds in muscles —for evacuating pus contained in abscesses, and guarding against a reaccumulation—for overcoming muscular contraction—for favouring the adhesion of detached surfaces, and on many other occasions.

Before we proceed to its application, let us remember, that as circular compression, of any force, necessarily impedes the return of lymph and venous blood, we are by no means ever to perform it in the centre of a limb, the end of which, not being included by the bandage, will by stasis and accumulation of fluids there, as it were imprisoned, become engorged. This being premised, and supposing the disease for which compression is to be exercised to be situated on the upper part of the leg or thigh, the following is the method in which we proceed to apply it.

We begin by enveloping the first three toes in strips of bandage or tapes, some lines in width, describing spirals up to the bend of the metatarsal articulation; and then lay the ends of the tapes flatwise on the instep.

Next, taking a bandage of a length proportionate to the extent of the parts which it is intended to cover, we apply the outer surface of the initial end on the back of the foot, and direct the bandage obliquely, in such a way as to inclose all the toes in two turns *en masse;* these two turns of the bandage, when well applied, doing away with the necessity of the smaller one adapted to these organs. The bandage is then brought up to the ankle by a series of spiral turns, and then the lower end of the leg is encircled, covering one malleolus, the tendo achillis, and thirdly, the other malleolus; and the bandage is then brought back upon the instep. From this point, it is customary to commence going up, and encircling the limb; but if we dread the occurrence of œdematous engorgement in the space situated under the malleoli on either side, which, as also the heel, is not covered, we lower the *centre* of the bandage, crossing the instep from above downwards, and pass successively under the foot, in front and on the other side of the heel; cross afresh the instep, but from below upwards; make another turn like the preceding, near and above the heel, and by a reversed fold, whose back is uppermost, envelop the heel itself; this new turn is supported by two others, one above, the other below the heel; and finally, every thing being covered, we come back again to the place on the lower part of the leg, from which we set out. The relations existing between the width of the bandage and the dimensions of the foot, compel us to make two or several reversed folds in opposite directions. By continuing the spiral turns, we smooth the bandage, and guard against making cavities by a series of reversed folds, the back of which is upwards so long as the limb continues to increase in size, and downwards when on the contrary it begins to diminish in volume; in this way we come to the place where the disease exists, and there the bandage is fastened, that it may not have to be renewed at each dressing.

In the series of turns made from the lower to the upper end of the limb, we must carefully graduate the pressure, which, being at first most powerful at the free extremity, grows less and less so as we near the diseased part, so as to drive the lymph and venous blood before it, towards the heart. The degree of constriction exercised

will never be such as to interfere with the circulation; and that degree even which it may be requisite to obtain must not be effected on the first application, but gradually brought about, by increasing the pressure each time the bandage is replaced. Lastly, the condition of the bandage must be looked to from time to time; if it be relaxed, and above all if pressing unequally, it is proper to reapply it. Circular compression can be attended with fatal effects only when the precepts which we have now laid down have been neglected. Of the imperfections in the apparatus, the weightiest, without dispute, is too great compression. When this is caused uniformly by the entire apparatus, to a degree such as to prevent the afflux of arterial blood, it will produce partial gangrene, and even complete sphacelus of a member, owing to atrophia from impeded circulation. When the pressure arises from two or three turns of the bandage being too tight, the venous or lymphatic congestions caused by the strangulation, which is the obstacle to a return of the fluids, will be productive of a like result. It is the duty therefore of the surgeon frequently to inspect the apparatus; and to heed watchfully the complaints made by patients of pain and numbness in the compressed part.

When pus is flowing from a solution of continuity towards its upper part, it is advisable to make a new bandage, the layers of which, beginning towards this upper part, at a certain distance, descend to the neighbourhood of the diseased part. But as, however, there exist oftentimes in these cases large abscesses whose walls it is proper to bring into contact, to effect adhesion between them after the pus has been let out from their cavities, we are to place graduated compresses upon their course by which their sides may be approximated.

There is, finally, a fourth species of compression which, owing to its mode of action, in a measure partakes of the effects of the other three; that viz., which has for its object the prevention or impeding of the morbid growth and development of certain cancerous, fungoid and aneurismal tumors.

Its more usual action consists in flattening the part affected against some point of support, so as to create langour in its circulation. Chronic enlargement of the mammæ affords an instance of its application. The fulcrum is here a lateral one. In this case, this species of compression is effected by surrounding the breasts with elongated compresses, one upper and one under, placed in an elliptical

form, and retained by a middle one. Masses of lint serve to make increased pressure upon parts in which it is judged proper to augment its power. The dressing is kept in place by a bandage, some of the turns of which are oblique and pass under the breast and over the shoulder of the opposite side, and the others, circular; the latter envelop the chest by passing over and beneath the mamma of the other side. It is manifest that the pressure effected by this species of bandage, which forwardly acts by itself, partially so also above, downwards, and on either side, and posteriorly by the resistance offered by the point of support, is at once direct, circular and lateral, without being entitled to any one of these denominations in particular.

Very little reflection is needed for the application of this species of compression upon an aneurismal tumor, or indeed in any other circumstances which might call for its employment.

OF SUSPENSION AND OF SUPPORTS.

The means used for the support and sustenance of parts are as numerous as the cases in which they are required.

Pillows and cushions are resorted to in very many cases, which demand that various positions shall be given to the head, trunk, or limbs, whether it be advisable that such parts be elevated, depressed, or inclined. Certain apparatuses likewise fulfil this indication. The ends of a band fastened and stretched between two bandages, one of which goes round the head, from the forehead to the occiput, and the other around the chest under the arm-pits, answer, according as they are of different lengths, to keep the head flexed, stretched, or inclined to one side, in cases of wounds involving the fore, posterior or lateral parts of the neck.

The sling bandage, so called, is an excellent support for a fractured lower jaw.

A piece of linen folded scarf-wise, and tied upon one side of the neck, supports the weight of a flexed upper extremity in the loop which it forms below.

The scrotum, penis, and mammæ, which by reason of their very lax tissue and lively sensibility, are frequently the seats of serous and inflammatory congestion, have peculiar need of support when diseased, because of the painful dragging sensations which attend their motions and the great increase of their weight. Their situation, also, and their projection from the surfaces upon which they ori-

ginate, and to which they adhere but in a limited part of their extent, renders them liable to injury and to frequent external lesions, and we are therefore compelled to fasten them as much as possible to other parts. Bandages which suspend and protect the penis and the testes, are called suspensory; and are little bags in which these organs are contained. The suspensory bandage is pierced with a hole, which gives passage to the end of the penis, and is sewn superiorly to a belt which does not allow of its descent. The mammæ we support either by oblique turns of a bandage, passing beneath the breast and shoulder of the other side; or else by a sort of pockets sewn upon a belt which superiorly encircles the chest, and which is prevented from yielding to the weight of the organs, by being supported by shoulder straps.

A good substitute for this bandage is a well made, and rather tight pair of female corsets. When fatty, bloody, or encysted tumors, old herniæ, and the like, have grown to such a size as to be either troublesome or painful, from their weight, we are to endeavour to obviate their swaying from side to side, by supporting them for a great extent of their surface, and by affording them, if possible, a point of support upon the trunk of the body.

Lastly, we uphold by napkins, or a kind of apron laced upon the loins, the weight of the abdominal viscera, in persons labouring under herniæ, protrusions of the bowels, ascites, in pregnant females rendered uncomfortable by the weight of the uterus, and in the corpulent.

Different surgical maladies are facilitated in healing by medicinal applications, which, from being locally exhibited, are called *topical*. With these, varied as they are in the degree of their consistence, in their properties, which depend upon the articles in their composition, and in the diverse forms in which they are made, it is necessary to be acquainted; and they require too minute and extensive a consideration to be comprehended under the head of dressings; we have therefore determined to arrange our remarks under a special article, the more that the various indications to fulfil which they are prescribed often cause them to rank as particular means of treatment, by which the form and dispositions of dressings are altered and decided.

OF TOPICAL MEDICINAL APPLICATIONS.

Medicaments are called topical, which are applied upon the external tegumentary surface or skin. From their name it might be conjectured, that the effects of these remedies are felt on the seat itself of their application, which in a majority of cases is correct; but owing to the sympathy which connects all parts of the organism by a common link, any remedial agent applied upon the skin, produces always, independently of its local action, an effect which is general, and more or less decided. Topical medicines are never indeed used in the practice of physic, but for the purpose of influencing the general morbid condition by the effect produced upon the local sensibility.

If the term topical agent be taken in its most general acceptation, there is scarcely a substance in nature which may not merit the appellation. As to those which form a part of the wide range of chemistry and the materia medica, there are few which are not employed, more or less frequently, for external use.

The effects of topical applications are various. In reference to their local action, all act primarily from their temperature, and by their state of dryness or humidity. As it regards their qualities, some affect the sensibility of the skin; others act only by a physico-chemical agency upon its contractility; others, having chemical affinities to our tissues, destroy their organization in their own decomposition, and either possess themselves of some of their elements, or part with their own in the formation of new combinations.

Upon the organization generally, the modus agendi of topical remedies is effected in a two-fold way. First, by that irradiation called sympathy, the method of whose transmission we are yet ignorant of, and which is the cause why an impression made upon the sensibility of one extremity of the nervous system, reacts upon

another point, and alters the manner of its vitality: and secondly, by cutaneous absorption, which, by carrying into the general circulation the medicinal principles themselves of our remedies, allows of the action of their properties upon the economy at large.

There are three forms in which topical agents are employed: the solid, the liquid, and the gaseous. Those are called *soft* whose consistence is intermediate between that of the two former, and is due to the mixture of a liquid with a pulverized solid body.

Although topical remedies are rarely applied but upon the skin, there are some which are made to penetrate directly to the mucous membranes, or inner tegumentary surface; among which number are gargles, clysters, and fumigations. As these medicaments, by the place of their application and their mode of action, appear to hold a middle rank between internal remedies and topical remedies, properly so called, they have been named semi-internal topical agents; a scholastic distinction, by the way, of but little importance.

It is seldom that a single substance, as water, or a pulverized solid, is used as a topical agent. On the contrary, we apply usually under this name, combinations of a greater or less number of different articles, generally as mere mixtures, but making sometimes, however, more or less intimate compounds.

The limits of this work, and the therapeutical view which it is our intention to take in their consideration, has induced us to begin with the forms under which they are used, as the starting point in the examination of topical remedies. These forms depend upon the nature of the components, and of the aim for which they are directed. Not to deal in the vagueness of generalization, nor to fatigue with unprofitable repetition, we shall delay our account of forms and properties, until we treat separately of each compound.

Although we have directed our attention principally to the uses of topical applications in surgery, we have thought it our duty likewise, when opportunity offered, to point out, in a general way at least, those cases which in the practice of physic claimed their exhibition. Strictness of methodical arrangement we have sacrificed to the superior importance of these useful observations; and there are, moreover, fewer objections to the method, insomuch as that the line which divides physic from surgery is in many affections scarcely appreciable; and that often a topical application favours recovery less by the local effect to produce which it was employed, than by the alteration it impresses upon the general sensibility.

OF CATAPLASMS, OR POULTICES.

A cataplasm is a soft and moist epithema, which is spread upon a piece of linen to be laid on the surface of a part. The composition of poultices is exceedingly various, owing to the numerous effects which they are intended to produce. The greater number of the agents employed in the materia medica, are exhibited under this form. The bases of poultices are soft substances, susceptible of being made into a kind of paste with water; to which are added, according to circumstances, divers medicinal substances in powder or in solution.

Three sorts of materials enter into the composition of a cataplasm: that which gives to it its size and form, and is called the *excipient*, that which serves to moisten it, which is called its *vehicle*, and the superadded medicines called the *accessories*. These terms are suitable only to compound poultices, in which the latter ingredient is to produce the principal effect. A simple poultice, on the contrary, such as a mixture of flax seed with water, consists of but the two former substances, there being, properly speaking, no accessory.

Farinaceous materials are, for the most part, those employed for poultices; such are the flours of flaxseed, rye, barley, oats, rice, potato; crumb of bread, leaven, &c. will produce a like effect. We make use likewise of the powder of mustard seed, and of different parts of plants; the roots of the mallow (*althea officinalis*), of celery, and of the carrot; the bulbs of lilies, the onion and the garlic; mallow leaves, the leaves of the belladonna, the cicuta, the sorrel, the horse radish, and the watercress. Roots are to be rasped, if used in their raw state; but when boiled, are to be reduced to a pulp. Bulbs and leaves should be crushed, the latter being stripped from their nerves and foot-stalks.

The more common vehicle is water, either pure or impregnated with different animal or vegetable products, among others, mucilage, gelatine and different tonic, narcotic and astringent principles. Other liquids are used also, which differ but little from water in their qualities; such are milk and serum. Others, as wine, vinegar, oils, and fatty substances, serve to meet various indications; and are used either alone, or are added to and mixed with some substance previously moistened with water. Nearly all these poultices should be exposed to the fire. It is idle in any case to prolong their boiling; which indeed is hurtful, when the mixture consists of different

ingredients which might produce mutual decomposition, or of volatile matters which might be totally dissipated. The accessory articles which are added to cataplasms, are introduced with a view of increasing their activity. Often indeed the epithema is but a method, or so to speak, a way of applying the only active ingredient in poultices, or that at least which is alone connected with the indication to be fulfilled, to the skin, to effect its sensibility and allow of its being absorbed. The therapeutical agents which are employed as accessories are, either tonic or astringent powders, the alcoholic tinctures of stimulant, aromatic or narcotic principles, or aqueous infusions which partake of similar virtues.

Poultices act, by their temperature, by the moisture which they communicate to the skin, keeping it as it were in a perpetual bath, by the absorption either of the water itself, or else of the different medicinal principles, and by the mode of action of these principles on the general or local sensibility.

The temperature of poultices is one of the most energetic reasons of their action. They are repellent when cold, and if moreover, owing to the ingredients of which they are composed, they are astringent or slightly narcotic, they become powerful sedatives in certain inflammatory affections, such as burns.

Poultices which are intended to be applied cold, are but very feeble in their effects when this temperature has become elevated in some measure by contact with the skin. It is necessary, therefore, to renew them often, particularly in warm weather. When moreover, the surface on which they are to be laid is extensive, their employment in winter had better be avoided, at least, throughout the night, as the contact of such moist and cold substances may induce rheumatism, colds, and a number of other diseases.

When tepid, cataplasms effect a species of maceration of the epidermis, which swells and becomes of a dull white. They extend their action to a certain depth, and the substance of the integuments becomes as it were softened; at this temperature all those which are intended to act by absorption, ought to be applied.

Very hot cataplasms naturally operate like rubefacients, of whatever materials they may chance to be formed. Whenever we design to obtain from a poultice a repellent effect, a temperature of 40° to 45° of the centigrade thermometer should be adopted. It has been generally noticed that a repellent effect is surer and more complete when poultices are applied upon the extremities and are made to

cover a considerable extent of surface. Neither is it a matter of entire indifference, when applying them for a specific affection, to select either an upper or lower extremity for the purpose; observation and experience on the subject having taught us, that there exists a closer sympathy between the lower limbs in affections of the head and abdomen, whilst in thoracic diseases, the upper extremities are to be preferred.

In every case, be the indication for which our poultice has been exhibited, or its nature, what it may, it must always be sufficiently moist, and be never left more than twelve hours in contact with a part, without being changed. A dry poultice irritates the skin after the manner of a hard body. Under these circumstances, the pressure of a bandage, or the motion of the patient gives rise to the formation of red and painful wrinkles upon the skin. The paste cannot be removed from these wrinkles without being moistened. This difficulty may be obviated, and desiccation prevented, by adding to the ingredients of the poultice a little olive oil, or butter. A poultice which has been left on too long, is decomposed by the interaction of its constituent parts, and by their combinations with the fluids exhaled from the cutaneous surface, which may occasion effects the very reverse of those which it was intended to produce. Emollient cataplasms afford frequent illustrations of the occurrences which we have now described.

One way of applying a poultice is in use for every kind. We lay upon some smooth surface, such as a table, a square compress of thin old linen, and pour into the centre of it the soft paste of the cataplasm. Then raising the compress up by the two angles of one of its sides, we apply it upon the mass, and placing the hand flatwise upon the side of the depressed piece of linen, bring it towards ourselves, spreading the paste towards the edge, which is then left adherent, but at the same time we press the matter contained in the fold, toward the centre. The same process is performed on each of the other three sides, and thus we obtain a surface which, by practice, will become smoothly besmeared with a uniformly thick layer of the mass. The four sides of the compress make a kind of casing. When, as it is usual to do, we are going to apply our poultice upon the bare skin, in the state which we have described, it is now all ready; but when it is intended for the face, or the surface of a wound, it is proper to spread a piece of delicate muslin, or gauze, over the paste, and the poultice is then said to be between two cloths.

It is then placed upon the surface for which it is designed. To keep it in its place, and prevent the paste from spreading by accidental pressure, and so bedaubing the parts adjacent, the poultice is overlaid by a compress still wider than itself, and the edges are held down by a few circular turns of a bandage, applied with some firmness.

In removing a poultice, care must be taken to prevent the cold from striking on the moistened part, by wiping it directly with a dry cloth. This is a piece of advice particularly obligatory, when, as in rheumatism, cold might be attended with the return of acute pain.

Poultices, from their composition, and the effects which are obtained by their use, are divided into emollient, astringent, stimulant, irritating, and narcotic: some, from possessing jointly the properties of several others, have been called mixed.

EMOLLIENT CATAPLASMS.

The different kinds of farinæ, or feculæ, the leaves of mucilaginous plants, and crumbs of bread, are principally employed for their bases. The liquid, or vehicle, is water, milk, a gelatinous broth, or a mucilaginous decoction. We use them tepid, or at a temperature rather above that of the human body. In some cases, however, when the skin is the seat of pain, or itching, which the slightest feeling of heat will increase, we apply them cold.

The object of emollient cataplasms is to keep up moisture, and an uniform temperature in the seats of their application. They relax, and render supple the skin, when it is affected with dry and acrid heat, and, by moistening the subcutaneous cellular tissue, favour capillary circulation, by the fluids which they offer for absorption; an effect, brought about by the local bath, which, by the medium of sympathy, extends its effects to a considerable distance. They are proper in the different phlogoses, deep seated, or superficial. Boils, more generally call for their application; and whilst they lessen inflammation, they promote suppuration. The same effects are observable upon the surfaces of wounds, ulcers, or of blisters which have ceased to suppurate, and whose surfaces have become dry from an excess of inflammatory action.

Emollient poultices are likewise proper in membranous and parenchymatous phlegmasiæ, and when applied upon the walls of the visceral cavities, produce effects which are analagous to those

obtained in cases of inflammations deep seated in the limbs. Accordingly, when laid upon the chest in pleurisy or in pleuro-pneumonia, they put an end to the pain in the side, allow of more easy respiration, and facilitate expectoration; when applied over the abdomen, they allay pains, diminish tenseness of the belly, and in cases of gastro-enteritis, peritonitis and cystitis, aid in promoting fœcal evacuation. Another result of their use is the happy change which they effect in the sensibility of the skin, which, from being dry, hot, and rough, becomes very often moist, cool and perspirable.

Emollient cataplasms, to conclude, are not wholly without a revulsive or derivative effect, the more decided the weaker the patient is, or the more his original sensibility is lively and acute; in this way it is, that when these epithemata are applied upon the head, they relieve old cephalalgiæ, and that, in many diseases, they produce very marked revulsive effects, when placed upon the limbs of persons upon whom sinapisms operate with too much violence.

Now that the old hypothesis which supposed inflammation to be an increase of vital properties, and of activity in the capillary circulation of the part affected, is crumbling to decay on every side; and now that the researches and admirable experiments of many modern investigators, among whom Dr. Wilson Philip deserves the highest place, inevitably lead us to the conclusion that in inflammation the flow of blood is slackened, and that its more solid part stagnates, as it were, in the phlogosed capillaries: we are at no loss to conceive that the watery absorption which results from the lasting contact of a poultice on the skin, may serve to relax the tissues, re-excite capillary circulation, and favor suppuration; but it still remains for us to account for its action in a disease afar off, or very deep seated. It becomes probable in the latter cases, that the nervous system, whose power is felt over the whole of the organism, and whose sensibility is now changed in a particular spot, is the real agent of transmission between the part diseased and that to which the remedy is applied; whilst the increase of activity induced in the local circulation by a poultice, may be looked upon as a counter-irritation similar to, though less energetic, than that obtained from the use of sinapisms.

The irritation which emollient cataplasms establish upon the tegumentary surface, is demonstrated moreover by another phenomenon; namely, the formation of a number of small conical pimples, red at the base, and at their summits having a point of suppuration. The eruption of these pimples is both preceded and followed by an

acute itching, which often obliges the patient to scratch himself, on the removal of the poultice. It has been said that this appearance was owing to applying the poultices too hot; but it is met with also where this had not been the case. It has again been urged that the cause might be some rancidity in the butter used, or in the oil of the flax seed. This explanation, deduced from the fact that vegetable matters pass into an acid state, is a more probable one, particularly as the effect is observed to follow the fermentation of a poultice made merely of crumb of bread and mallow water. The mingling of acid perspiration, or the discharges from wounds with the material of the cataplasm, aids considerably in its decomposition. But be this as it may, irritation on the skin occurs always with more certainty, the longer a poultice is allowed to remain upon it. When therefore we seek to obtain an emollient effect from a cataplasm, it must evidently be often changed, and no materials capable of fermentation, which have grown stale by exposure to the air, ought ever to be employed.

Langour, and a state of œdematous puffiness is induced in the tissues, by the too long continued appplication of a poultice. This result has been attributed to an accumulation of serous fluids, those, that is to say, in which water predominates. The inertia and debility which follow this effect, have caused the employment of an emollient poultice to be considered as contra-indicated, where an individual is characteristically feeble, or in diseases of a low type, such as passive hæmorrhages, hospital gangrene, &c. When pallor begins to show itselfabout a wound or ulcer, from carrying on too long the use of a poultice, the exhibition of the means must be suspended. Cicatrization will then rapidly proceed.

In certain cases, peritonitis for example, in which the employment of an emollient poultice would perhaps give great relief, it will nevertheless be often impossible to use it, because of the pain produced by its weight upon so large a surface, when tenderness is extreme. Fomentations with flannels steeped in hot emollient decoctions must take its place. And in opthalmia, orchitis, &c., the mucilage of flax seed or elm bark may be substituted.

Formulæ for Emollient Cataplasms.

No. 1. R. Sem. Lini Contus. Aquæ Puræ, vel Decoct. Altheæ, aa. q. s.

No. 2. R. Sem. Lini Contus. et Hordei. Commun. aa. p. e. Aquæ Puræ, vel Decoct. Altheæ, q. s.

Boil the meals in the water or decoction, and stir them until the paste becomes too solid to flow. Spread, and apply them.

No. 3. R. Sem. Lini, vel Micæ Panis, ʒiv. Rad. Altheæ, Flor. Malvæ, Flor. Sambuc. Nig. aa. ʒij.

Boil them, bruise the roots and leaves, and reduce them to a pulp, and mix them with the flax seed, or bread crumbs boiled in the decoction of the herbs.

No. 4. Lactis vaccini, Micæ Panis, aa. q. s. M.

Boil them to a suitable consistence. This, in the country, is a very convenient poultice, where often flax seed cannot be got, whilst bread and milk are every where abundant. It is, however, as Hunter has remarked, objectionable from drying quickly, and becoming friable and breaking. This may be in part obviated by the addition of a little grease, or butter, or the yolks of one or two eggs beaten up.

No. 5. An excellent emollient poultice, which has also slightly astringent and narcotic properties, is made with potatoes boiled and beaten to a pulp, and afterwards mixed with as much milk, or water as is necessary; starch may also be used as the vehicle. In burns, or highly painful inflammations, its effects are very happy.*

ASTRINGENT AND TONIC CATAPLASMS.

Every astringent substance may be brought into use in the composition of these poultices. Those more commonly selected, are cinchona bark, oak bark, willow bark, nutgalls, bistort and tormentil roots, green medlars, most wild fruits, the leaves of the bramble, or briar, and the petals of the roses of Provins. All barks and roots should be dried and pulverized; or if they are fresh gathered, should be cut into fragments and boiled, so as afterwards to be beaten into a pulp. In most cases, it is sufficient to sprinkle an emollient poultice with powders of an astringent property, or else to employ a decoction of these substances, sufficiently strong to possess their virtues, as a vehicle. If an effect still more powerful be desired, the powders themselves are taken as the excipients, and are moistened with the decoctions of vegetable astringents. If the mineral astringents, the white and green vitriols, for instance, be employed, we must be guarded as to quantity; and, if the solution is very concen-

* In addition to those already mentioned, we have thought proper to subjoin the following.—*Trans.*

No. 1. R. Cort. Ulmi Amer. trit. Aquæ Calid. vel. frigid. aa. q. s. to make a poultice of proper consistence.

Also that recommended by Abernethy.

No. 2. R. Micæ Panis, Aquæ Bullientis, aa. q. s. M.

trated, only a small portion of it should be spread over the surface of a poultice prepared beforehand. Alum is the most convenient, since no danger need be apprehended from its use.

Astringent cataplasms are used for obtaining both local and general effects.

Their local effect is beneficial in burns, œdema, and emphysema; in arresting the progress of certain mortifications, in stopping passive hæmorrhage: and they have been recommended for facilitating the return of a recent hernia, by causing a retraction of the integuments, after the taxis had failed, and before an operation was undertaken. This latter application, however, which may of itself add to the irritation which the hernia has produced, exposes us to the serious hazard of frittering away precious time in futile attempts, which in the largest number of cases at least will be useless, if nothing else. When used as general therapeutical agents, poultices sprinkled with cinchona have occasionally been used with success in intermittent fevers, in debilitated persons, when the irritability of the stomach forbade the administration of the remedy internally.

*Formulæ for Astringent Cataplasms.**

R. Micæ Panis, Pulv. Bistortæ Polyg. vel Tormentillæ erect. p. e. aa. Vini Oport. fort. q. s. M. pro epithemate.

If it be feared that the alcohol will produce irritation, water containing a few grains of alum in solution is to be substituted for the red wine.

This poultice may be exhibited instead of that which is made with the cinchona, but it does not possess the febrifuge virtues of the latter. If it be intended to pay attention to this particular indication, we are to spread the powder of cinchona in sufficient quantity over the bread or flax seed poultice previously at hand, so as to cover its entire surface. A very powerful astringent effect being required, the bistort root, the pure gall-nuts, or else the cinchona, either in powder, or reduced to a pulp, should be employed cold.

The happiest effects from astringent cataplasms are obtained in cases of burns. Nearly every article which is productive of astringency succeeds in these cases, but the best application of all is the

* The annexed astringent cataplasm is sometimes resorted to as a topical application in the treatment of opthalmia.—*Trans.*

R. Pulv. Sulp. Alum et Pot. gr. xx, beaten up with the albumen of an egg.

poultice of scraped raw potatoe. By reason of its properties, it is at the same time astringent, emollient and narcotic. When fresh and spread upon a burn, it speedily allays the pain and arrests the progress of the inflammation. It must be renewed each time that it becomes dry, which it does very quickly; and by observing these precautions, it will rapidly cure burns which are neither very deep, nor very extensive, without the production of vesication.

Of Pounded Ice.—We shall here take occasion to mention another species of epithema, which, from the constriction it induces, is analogous in its effects to astringent cataplasms, although widely differing from them in other respects; namely, the application of pounded ice.

This article is used as a repellent of much power in the most diverse cases. It has been made available in the cure of burns of greater or less extent, in phlegmon and erysipelas, to prevent the development of inflammation; in herniæ not reducible by the taxis, to effect their return by means of contracting the scrotum and cremaster muscle; upon the head, to diminish the afflux of blood to that part in inflammations of the brain. And recently, it has even been employed with a view of preventing the inflammatory swelling which is subsequent to a fracture. This active agent, however, must be attentively watched; for although the best results may be derived from the sedative effects of the cold, it behooves us to be careful lest its long continued contact produce sphacelus, by freezing parts of great sensibility, such for instance as the spermatic chord, when it is employed in herniæ.

Ice is applied by filling a bladder either with lumps of the material pounded, or with snow; the cold, in this way, acts without wetting the patient, and its effects are confined to the parts alone on which we design them to be felt.

STIMULATING CATAPLASMS.

Beneath this common head are arranged different epithemata, whose properties are wholly owing to a metallic salt, or to some volatile, acrid, acid, aromatic, alcoholic, or ammoniacal principle.

Antiscorbutics, such as horseradish root and the leaves of the plant likewise, the leaves of the cress, the common scurvy grass, and the brook lime, when bruised and applied upon bare scorbutic ulcers, and also upon tetters and syphilitic eruptions,

tions, when they had become atonic, have been productive of good effects.

Acid cataplasms are energetic exciters of capillary sensibility and circulation; they are made use of under the appellation of *maturative*, on the surface of parts affected with chronic abscess, upon scrofulous tumours, and upon indolent congestions whose suppuration we desire to accelerate; as *detergent*, we resort to them in fungous, atonic, and flabby ulcers, which we wish to revive. The poultices are composed of different excipients moistened with vegetable acids, such as the citric, oxalic, and acetic, or with leaves and fruits which contain them.

Formulæ for Maturating Cataplasms.

No. 1. R. Excipient. Emollient. q. s. Pulpæ Lilior., Fol. Rumicis Acetosæ, aa. ℥ij, Ungt. Basilic. ℥j. M.

No. 2.* *A poultice for use against hospital gangrene, and for reviving ulcers in aged persons, which are atonic, greyish, or attacked with gangrene.*

R. Cataplasm. Emollient. q. s. Limonum Segmentor. M.

The slices of lemon are alone sufficient, oftentimes, for causing the production of red, vascular, and cellular granulations, and the secretion of a creamy and inodorous pus upon the surface of ulcers which were previously pale, fetid and flabby.

By a *resolvent* poultice, we understand one which produces only a very trifling stimulation, of a kind to assist in reabsorption, but not sufficient to excite or reinduce inflamation. The solut. plumbi acetat. and the aqua vitæ camphorata, are the means generally used for obtaining this effect. A few drops of either are spread over the surface of an emollient cataplasm. If the resolvent poultice is employed over an indolent tumour, by way of a *deobstruent*, as it was called in ancient surgery, its effects may be increased by larger quantities of the medicine, or it may be made thus—

No. 3. R. Saponis Albi, Farinæ Hordei, p.e. Aquæ, q. s. M.

It is proper to include in this section a cataplasm which is made

* The following formulæ are introduced under the denomination of antiseptic poultices, in consideration of their utility in the treatment of gangrenous and phagedenic ulcers, and in phlegmonous erysipelas.—*Trans.*

No. 1. R. Carbon. Ligni ppt. ℥ij. Farin. Lini, ℔ss. Aquæ, ℔ss. boil them for fifteen minutes.

No. 2. R. Spumæ Cerevis., ℔ss. Farin. tritici. j℔. Mix and expose it to a gentle heat. A substitute for this poultice is made by spreading yeast thickly over the surface of one made of bread and milk.

of ripe apples, which are cooked, and reduced to a pulp. Its effects as an emollient and feeble stimulant, when applied between two cloths, to the eye, in the decline of an opthalmia, are very happy, and it has not like simple emollients, the bad quality of being too relaxing, or of causing œdema of the eyelids and conjunctiva.

Aromatic stimulating poultices are compounded of the leaves and flowers of aromatic plants, among which, tansy, wormwood chamomile, thyme, sage, rosemary, &c. may be enumerated. They bring about a local and general stimulation, which in many individuals has a favourable tendency. When laid over the belly, they have, and in children particularly, a very decided purgative and vermifuge effect. This furnishes us with a precious resource, when the exhibition of anthelmintic medicine is prohibited by the existence of a gastro-intestinal irritation, to which the presence of worms often gives rise. Tansy, applied over the abdomen, has succeeded in the hands of M. Guersent in effecting the expulsion of about forty *lumbricoides*, and that without any perceptible increase of an intestinal phlegmasia, under the influence of which the remedy had been exhibited.

An excipient boiled in wine, or moistened with some aromatic alcoholic tincture, such as that of cinchona, canella, several of the labiated plants, the melissa, lavender, the sage, &c. serves to make the diffusible poultices which are employed to restore strength in cases of prostration, without incurring the hazard of the fatal irritation which would follow the internal use of these medicines. The effect, however, of a poultice of this sort, though promptly manifested, is of brief duration, and demands frequent renewal.

When applied for local diseases, these epithemata are useful in reviving the surface of some kinds of atonic ulcers in feeble people, and particularly when there are gangrenous sloughs. But no abuse of alcoholic tinctures should be allowed upon these absorbing surfaces, and it is proper always to remember that the stimulus produced by diffusible remedies and those containing alcohol, is ever followed by collapse in a ratio equal to the factitious vigour which had been excited.

There is, finally, a sort of poultices which are made of animal matters, and to which we allude only to enter our protest against their use. Country people, who are great advocates for remedies of this kind, make use of animal excrement, viscera, urine, the nests of swallows, earth worms, and the like. The modus agendi of such substances varies according as they are fresh, or have begun to

undergo decomposition. In the former case, they act as emollients by their warmth, moisture, and immediate elements, albumen, gelatin, &c., or as irritants, by the urea, biliary resinous matter, &c., which they contain. In the latter case, an exciting effect is brought about by the ammonia or its subcarbonate; but more or less modified by the disengagement of fetid and unhealthy miasmata. We shall dwell no longer on the composition of applications alike disgusting in character and treacherous in their effects; for the resources of our art afford us a variety of means for obtaining the same effects with greater certainty, more cleanliness, and fewer objections.

IRRITATING CATAPLASMS.

There are a variety of vegetable substances which, when applied to the skin, are capable of irritating it. Such is the intensity of action of some of them, that they cannot be employed pure without producing vesication, cauterization, or the destruction even of the texture of the skin by the production of gangrene. These are articles which should be employed but in minute proportions, and as accessories only, and in combination with some excipient; among them are all the genus clematis, the euphorbia, the chelidonium majus, the acrid sedum, &c. These plants are, however, very seldom employed.

Others produce redness on the skin, and induce blistering only after being very long in contact with it, and in persons and on surfaces of exquisite sensibility; the alliaceous tribe, and the seeds of the sinapis nigra are the most often employed for the purpose. Poultices which are made with the powder of the latter substance have received the appellation of *sinapisms*, and by the extension of the term, epithemata are similarly named into which other things than mustard enter, and though very improperly, an irritating cataplasm, which, although analogous to a sinapism in its effects, contains no mustard at all, is likewise so called.

Sinapisms act in two ways. They speedily create an acute pain in the part to which they are applied, owing to an irritation in the nervous expansions, and, after some few minutes, a congested state of the sanguineous capillaries of the skin: a congestion which may be followed by permanent inflammation, from a prolonged or excessive action of the sinapism. The time therefore, for which a sinapism should be left on, must be proportionate to the known promptness and power of action of its constituents, and to the sensibility of the

part which it covers, and of the patient upon whom it is employed. They are usually removed after a lapse of two or three hours; the skin is then vividly red, extremely painful to the slightest touch, and the patient feels in it much smarting and an unpleasant sensation of formication. If the limits of mere rubefaction have not been exceeded, the pain and redness gradually go off, and the part returns in three or four days to its original condition. Sometimes the redness, which on the removal of the sinapism is inconsiderable, appears subsequently, and by the morrow assumes its maximum of discoloration; pain on the contrary progressively decreases, unless phlyctenæ ensue, which indicate vesication, or permanent inflammation. The sinapism in such a case performs the office of a hasty blister. The local employment of a mustard plaster is useful in reproducing, in its original situation, an exanthema which had receded, in augmenting and quickening the circulation in indolent tumours, for allaying the pain of recent rheumatism, &c. &c.

To the energetic local action of sinapisms, is owing the powerful derivative or revulsive effect, which they produce upon the system at large; and the readiness with which this effect is procured, makes them one of the most valuable of our medicinal agents. But the nervous irritation to which they give rise is at times, when carried too far, serious. Accordingly the application of sinapisms, in certain patients, is seen to be followed occasionally by febrile excitement, which adds to the irritation in the organ for which the remedy had been applied. It is easy to obviate this objection by lessening the activity of the sinapism by the use of an emollient excipient.

The cases in which sinapisms are proper, as derivative or revulsive agents, are so various, that even to enumerate them is impossible. We shall therefore merely cite, in a general way, as examples of a revulsive effect, the greater number of visceral phlegmasiæ, after the use of blood-letting has become impracticable any further, for fear of debilitating the patient; the frequent cases in which inflammatory action is coupled with irritation of the nervous system, which deter the practitioner from the use of any other means. They are particularly beneficial in much enfeebled persons, in whom it is desirable to produce slight stimulation; but they must then be used weak, renewed often, and laid on various surfaces successively.

In all cases sinapisms are placed upon both limbs at a time, one upon each correspondent part. The spots selected for the purpose

are, on the abdominal members, the sole and back of the foot, the calves of the legs, the knees, and inner surfaces of the thighs; upon the thoracic limbs, the inner and outer surfaces of the arms. When intended to produce a derivative effect, they are placed in the vicinity of joints, or upon the recently inflamed fibrous tissues in all cases of rheumatism, &c.; and they are useful, lastly, in producing an afflux of blood towards the part upon which they are applied: with this view they are placed on the inner and upper surface of the thighs, to bring back suppressed catamenial discharges.

Sinapisms are used cold, the active principle of the mustard seed being volatile. The same remark is applicable to most substances possessing similar virtues, such as the onion and garlic, pepper, &c. which are often added to increase the action of mustard, or are substituted for it; and also to the vinegar which serves as a vehicle for their exhibition. The most that should ever be done is to tepify the mixture slightly, if it is feared that the first shock of the cold on the skin might injure or annoy the patient.

Formulæ for Irritating Cataplasms.

No. 1. R. Farinæ Sinap. Acidi Acet. q. s. aa. M.

No. 2. R. Farin. Sem. Lini, et Sinap. aa. p. e. Acid. Acet. q. s. M.

The proportions of either meal may be varied of course, according to the indications which we design to fulfil. The epithema, thus diluted, may be left on for a longer time; its protracted action is gently effected; and it is perfectly proper in such cases as demand the production of slow revulsion, without any sensible general excitement being established.

No. 3. If it is wished to produce a violent local irritation, we may mix with our mustard flour some scraped horse-radish root, some cloves of garlic bruised to a pulp, and sprinkle the surface of the cataplasm thus composed with an ounce or half an ounce of black pepper, or else with the hydro-chlorate of ammonia. But such active sinapisms as this are rarely proper, save in extreme emergencies; and particularly when a patient is under the influence of so profound a coma, as that nothing can arouse him.

The following cataplasm will, in many places in which mustard flour is not to be obtained, and a sinapism is required, advantageously replace it.

No. 4. R. Micæ Panis, ʒiv. Bulb. Allii Sativ. No. IV. triturated to a pulp. Pulv. Piper. Nig. ʒss, vel ʒi. Acid. Acet. fort. q. s. M. pro epithemate.

NARCOTIC CATAPLASMS.

The poppy, the belladonna, the cicuta, the hyoscyamus, and such tinctures, electuaries, cerates and plasters as contain their active principles, constitute the means of which this class of poultices are composed, whether the plants themselves be used, or simply decoctions of them.

The effect of a narcotic is to deaden and obtund the sensibility, to slacken circulation, and in a word to diminish the activity of the organic functions of the part to which it is applied, or of the entire organism, when absorption of its principles occurs. It strikes us at once, therefore, that to put any large quantity of a narcotic remedy in a poultice which is to cover a large wound, in which when not too much inflamed absorption is very rapid, would be highly injudicious.

Narcotic cataplasms are made use of in all cases in which it is required to allay excessive pain and procure sleep, and, as an illustration, over the abdomen, in nervous colics, upon parts which are affected with gout or rheumatism, upon the course of nerves attacked with neuralgia, upon the cheeks for the tumefaction consequent on caries of a tooth, upon cancerous ulcers, and upon the surface of certain tetters or efflorescences when painful or troublesome from itching, &c. &c.

In spite of the happy results of which narcotics are productive, and the feeling of ease which after great suffering they procure, an immoderate or too frequent use of them must be avoided. Beneath the influence of this class of medicines, and consequent to the state of languor which they induce in the action of the organic functions, parts to which they have been long applied become easily congested from a kind of aneurismal dilatation of the capillary vessels; a state which is indicated by a purplish hue, by softness, flaccidity and œdema. Solutions of continuity, if any there are, when they have reached this condition have a tendency to remain stationary, and do not recover until narcotic applications are abstained from.

Emollient poultices are used as the excipients for narcotic medicines, which latter are mixed up with fecula in pulp or decoction; the duration of their application is limited by the interval which elapses between the dressings.

Formulæ for Narcotic Cataplasms.

No. 1. R. Capsul. Papaver. Alb. cut in pieces ʒi. Hyosciam. Nig. Fol.

recent. ℥ii. Boil in two pints of water down to a pint and a half; strain it and boil in it, Farinæ Lini ℥iv.

No. 2. In case of idiopathic neuralgia, when the pain is extreme, the following may be used.

Boil in two pints of water Capsul. Papav. No. IV. Fol. Cicutæ. Belladonnæ et Hyosciami, aa. ℥j. Strain and boil to a suitable consistence with Farina Lini, vel Mica Panis ℥ij.

In cases of more frequent occurrence, in which so decided a narcotic effect is not needed, we merely moisten the surface of an emollient poultice with a little laudanum, or else boil the flaxseed meal, or crumb of bread, in a decoction of poppy heads.

MIXED CATAPLASMS.

There are cataplasms which in a greater or less degree unite in themselves the qualities of several of the poultices we have now detailed. They fulfil many indications, and are much employed. Some of them indeed are always composed of elements which differ in their properties; narcotic poultices are of this kind, insomuch as they are composed of narcotic remedies, joined to an emollient excipient. It is easy to conceive, that by a mixture of diverse substances, the formulæ may be varied ad infinitum, so as to obtain effects which are more or less stimulant, astringent, emollient, sedative, &c. The only precepts which can be laid down on the subject are, that no substances are to be combined which will effect mutual decomposition, or whose virtues by an opposition of properties will be likely to be neutralized, as would be the case for example were narcotics to be added to a sinapism.

To enter in detail upon the composition of mixed cataplasms would be tedious, as the circumstances which call for particular modifications of their constituent ingredients are as numerous as are the individual cases which occur in practice. The good sense and experience of the surgeon can alone direct him, in the hour of need, to a choice of such as are most likely to meet the indication which presents itself.

OF FOMENTATIONS.

Fomentations are applications either dry or wet, which are made to the surface of parts to heat them and preserve their temperature. They differ from poultices, in that the latter are met with always in the form of boiled paste, and may be laid on cold, whereas a fomen-

tation, besides being necessarily always warm, operates, when a wet one, merely by its fluid parts being imbibed by the tissues.

All materials which have been previously warmed, for instance flax, cotton, and woollen cloths, bags of sand, and bran, bricks, or plates of metal wrapped in linen, bottles or balls of tin filled with hot water, &c. are used as dry fomentations.

Wet fomentations, which are what is generally understood by this term, are made with pieces of stuffs of all kinds, but particularly of linen and flannel, steeped in decoctions or infusions which possess emollient, tonic, aromatic, anodyne or other properties.

Dry fomentations are employed solely for the preservation of temperature. They are most convenient when enclosed in bags, and are, above all, useful to surround limbs after the ligature of the principal artery. They are laid upon the feet during the ague of an intermittent; on parts affected with rheumatism, very frequently, and on all places in fact which require to be heated, or in which the effects of a chill are to be dreaded. When we desire to bring about cutaneous perspiration, the heating articles ought either to be made of, or enveloped in absorbing substances, such as stuffs of various kinds.

Moist fomentations produce effects which are analogous to those of poultices; their lightness renders them preferable, when the parts upon which they are to be laid, are at once very large and painful, as upon the abdomen in peritonitis, for example. Placing them when very hot upon parts the skin of which is itself inflamed, should be avoided. Care should be taken to change them so frequently, as to preserve the tissue which sustains them always moist; but when there exists any inflammation of a rheumatic nature, or of an organ contained within a splanchnic cavity, the most sedulous care is necessary, lest in changing them, the surface be exposed to cold; and therefore, when the old fomentations are removed, the fresh ones are introduced beneath the bed clothes, and the patient is not uncovered.

Having said that the various decoctions and infusions of substances used in making poultices were employed as fomentations, we proceed to offer some formulæ.

No. 1.—*Emollient Fomentation.*

It is made of a decoction of marsh mallow root, or else of flaxseed mixed with an infusion of elder flowers, in which cloths or flannels are steeped, and laid upon the parts.

As there is generally a thin layer of air, which becomes saturated

with moisture, between a fomentation and the surface upon which it lies, it is advisable that the liquid should contain as much as possible some vehicle capable of easy evaporation, which may hold the medicinal principles in solution, or else some volatile substance, the properties of which should have some correspondence with the effect which it is wished to produce, which happens in the instance above mentioned, viz. the infusion of elder flowers. Volatile emanations like these, suspended in the stratum of moist air, enter better into the pores of the skin than do fixed principles, although possessed of like properties.

No. 2.—*Tonic, Resolvent and Astringent* Fomentation.*

R. Vin. Oport. ℔j. Rad. Bistort. Aquæ Malv. Aq. Punic. Granat. aa ʒij. Hydro-chlor. Ammoniæ ʒij. M.

No. 3.—*Irritating or Sinapised Fomentation.*

R. Aquæ Calid. ℔j. Farin. Sinapis. ʒiv. M.

No. 4.—*Anodyne† Fomentation.*

R. Fol. Belladonnæ ʒj. Capsul. Papaver. No. ij. Decoct. Emoll. ℔j. M.

The exact circumstances under which either of these combinations are to be used, being precisely similar to those indicated for the poultices whose place they take, we have omitted to detail them.

OF BATHS.

We apply the term bath to the immersion of the whole or part of the body into a medium which is water most usually, whether fluid or in a state of vapour. The medium is at times however, a pulverulent substance, say sand for example.

Baths receive different names according to the part immersed; and the local is distinguished from the general bath. General bathing is that in which the whole surface of the body, save in a hot bath

* The subjoined formula is used when cold, as an astringent fomentation for hæmorrhoids and prolapsus ani.—*Trans.*

R. Gallar. Contus. ʒss. Aquæ Fervent. ℔ij. Macerate for an hour, and strain it.

† We have here affixed an additional anodyne fomentation, which will be found soothing, when applied for inflammation of the eye, for various ulcers, and other diseases attended with intolerable pain.

R. Papaver Alb. exsicc. contus. ʒiv. Lini contus. ʒj. Flor. Chamæmeli ʒij. Aquæ distill. ℔vj. Mix and boil them till only a quart remains, and then strain it.

he head, is submersed in the liquid. Local baths may be applied to all parts which, from their position, may be covered by the water apart from the rest of the body. Some of them have acquired peculiar appellations. For example, that in which the fluid rises no higher than the waist, is called a demi, or semi bath; the pelvis and lower limbs only enter the bath, whilst the trunk and upper parts remain out. A bath for the feet alone, is called a pedi-luvium; that for the hand, a manu-luvium; and that wherein the patient sits, his thighs strongly bent on the trunk, and his legs hanging out of the bathing tub, the pelvis alone being in the fluid, is called a seat bath.

As it regards temperature, we have *very cold baths*, at from 0° to 10° of the *centigrade thermometer*;* *cold baths*, from 10° to 18°; *cool baths*, from 18° to 25°; *tepid baths*, from 25° to 32°; and *hot baths*, from 32° to 38° or 40°, the temperature of the human body. Some few experimenters have tried upon their own persons the effects of *very hot baths*, at 45° of the centigrade thermometer; but besides that the employment of this measure is attended with no beneficial therapeutic results, experience has demonstrated it to be productive of alarming congestion, particularly of the head.

A third distinction is that which relates to the nature of the water itself, as to whether it is pure, or impregnated with medicinal principles, either suspended or in solution. Salts of various kinds, particularly of soda, of potassa, and of iron; sulphur, ammonia, carbonic acid; direct vegetable or animal principles, and the like, are found in nature in solution in water, which then in therapeutical language is called mineral water. By combining the ingredients in the same proportions, the same waters may be artificially prepared. Medicinal virtues of all sorts may be imparted to water by cold solutions, or by decoctions of various emollient, astringent, tonic or narcotic substances. Nutritive baths are prepared with milk, gelatine, &c.: but it is somewhat doubtful whether cutaneous absorption be

* To reduce the centigrade scale, being that employed on the continent, to that of Fahrenheit, we are to multiply the degrees of temperature by 9, and divide the product by 5, and 32°, the difference between the zero of Fahrenheit and that of the centigrade, is to be added to the quotient.

: of the cent. $45^{\circ} \times 9 = 405 \div 5 = 81 + 32 = 113$ Fahr.

See Art. Thermometer, Brande's Chemistry. Art. Caloric, Turner's Chemistry.—*Trans.*

sufficiently active, really to make this an available process for the introduction of aliment.

Baths are directed as hygienic, or as therapeutic agents. Their effects vary according to the three conditions previously detailed, the temperature of the water, its chemical qualities, and the parts to be immersed; they differ moreover, according to general circumstances derived from the climate and season; to individual ones, such as age, sex, habits of body, and profession; and lastly, according to the hour at which the bath is used, the distance of time from, or its nearness to the period of meals, sleep, &c., the patient's being in a state of health or illness, and the particular nature of the disease.

The bath at 0° centigrade is but little employed owing to the very great chill it produces, and to the crowding back of fluids to the centre, and cramps of the muscles consequent upon it. It is very useful however, in restoring the vitality of a frozen person or limb. Experience has taught us that in these cases a too rapid transition from intense cold to a common heat, is followed by gangrene. It is better at first to bathe the frozen part in very cold water. Frictions with snow are also in use; after a time the temperature of the liquid is gently and gradually raised. By proceeding slowly in this way, we succeed in reviving circulation in parts not entirely destroyed by congelation, with safety.

The cold bath, by inducing considerable reaction, is a powerful tonic and general stimulant. When, however, its temperature is below 10° or 12° of the centigrade thermometer, it produces a recession of blood from surface to centre, and may cause untoward congestions, as well as too excessive a reaction. When used locally and as an affusion, it is useful in surgical practice for allaying the inflammatory swelling subsequent to burns, diastases, fractures, &c. For this purpose, the affected part is surrounded with compresses wrung out of water at 0° to 5° of the centigrade thermometer, which are afterwards kept wet by dropping upon them, with a sponge, water at the same temperature. It is proper, whilst this treatment is pursued, that the bed and parts adjacent be protected from moisture, by passing a piece of oiled silk beneath the diseased part and shaping it like a gutter, so as to carry off the water as fast as it is received.

A cool bath at about 20° of the centigrade, is the most frequently selected for hygienic purposes. River baths in the summer season are taken at this temperature; and it is that also of salt water baths,

and of many mineral waters. It is bracing, and when taken in a piece of water of much size, its effects, inasmuch as they are accompanied with the efforts of swimming, are the more beneficial.

Tepid and warm baths at 32° to 38° centigrade, act in the same manner as do poultices and fomentations, by their warmth and moisture; they relax and are emollient; soften the surface of the skin, carry a more or less quantity of fluid into the system by absorption, allay a state of nervous irritability, which in many patients is so extremely annoying, facilitate the action of the centrifugal forces of the blood, dilate the pores of the skin, and dispose the body to transpiration. At this heat it is that local baths are almost exclusively employed by surgeons; and they constitute, for the above reasons, a most valuable auxiliary to the antiphlogistic treatment of inflammations, of the viscera particularly. Setting aside mineral waters of a natural formation, medicated baths are much less frequently employed as general than as local means, in medicine than in surgery.

It does not fall within our purpose, and would moreover be a task of too much length, to enter into a detail of the different kinds of general baths, and to point out their composition. Let it suffice to state, in a general way, that salt water baths, and chalybeate ones, are employed as tonics. Alkaline and hydro-sulphuretted baths are used in cases of itch, tetter, and other cutaneous eruptions of a chronic nature; mercurial baths have been applied, but with no great success, for syphilitic affections. Baths of hot sand have been made use of for rachitic persons, and in cases of rheumatism; and it is besides a means specially resorted to in surgical affections for the application of heat artificially to a part. Upon the subject of baths, as upon that of poultices, popular prejudice has attached credit to certain means which are supposed to possess imaginary virtues by vulgar credulity; such are baths of dung and animal substances. If such disgusting applications seem at times not to be without efficacy, they possess at least no specific qualities which are not had by any other means.

As local baths are especially resources of surgical art, we purpose to make a more enlarged examination of them.

These baths, which are emollient, tonic, or narcotic, operate in the same way as poultices; but exceed them in their power of action by the greater quantity of moisture which they introduce into the body, and by the ease with which their heat may be kept up, lessened,

or increased at pleasure by adding fresh liquid as the temperature falls or rises. Accordingly, when local inflammations occur, and the isolation of parts and a convenient situation, such as the feet, legs, fingers, hands, forearms, genital organs and breech in either sex, allow of our employing them, a frequent and long continued use of emollient and narcotic baths is made.

SEAT BATHS.

To take one of these, a common tub is all that is necessary. The fluid made use of is either water alone, or else emollient or anodyne decoctions. In cystitis and urethritis, they afford much relief, allaying these phlegmasiæ, and lessening the swelling and tenderness of the inflamed parts; they are also prescribed in inflammations of all the parts contained within the pelvis, or surrounding the anus. In females, their principal use is in affections of the vagina and uterus, for the recall of suppressed menstrual discharges. In taking one, the tub ought to be covered with a blanket, to prevent those parts not in the water from being affected with cold.

PEDILUVIA.

Foot baths differ in composition according to the effect which they are intended to produce. If merely a local inflammation is to be overcome, water alone, or an emollient decoction at 30° of the centigrade, is sufficient. But pediluvia are used in a majority of cases as means of producing revulsion from inflammation situated in one of the three splanchnic cavities. Their temperature is then increased, as far as the patient can bear without being scalded, and the liquid is rendered additionally stimulant by the conjunction of an irritating substance, dissolved or suspended.

Irritating pediluvia act in the same way as sinapisms; and there exists between these two means, either of which may take the place of the other, the same analogy which there is between baths and emollient poultices. This difference is however observable, that the foot bath, owing to its higher temperature, which is adapted to the sensibility of the patient or of the bathed part, acts more quickly than a sinapism; but its effect is more evanescent than that of the latter, unless, from the use of boiling water, blistering is produced on the skin.

The ease with which a great afflux of blood to the feet may be almost instantaneously solicited by a pediluvium, independently of

its irritating operation on the nerves, renders it a valuable resource under many emergencies. It succeeds admirably in cephalalgiæ, angina, phlegmon of the neck and truncal parietes, the dyspnœa attendant on diseases of the thorax, &c. &c.

A pail to hold the liquid is all that is wanted for the administration of a foot-bath. The patient usually sits with his legs in the water, and a blanket thrown over his knees, so as to cover the utensil and prevent him from taking cold. If he is confined to his bed or too delicate to rise and sit up, or there be any objection to his quitting his couch, we merely take out his feet, and they are received into the pail placed on a chair at the bed-side. The water generally is not deeper than is sufficient to cover the malleoli.

The length of time the bath is to be persevered in, varies according to the disease. An emollient pediluvium employed for the cure of a local inflamation, may be taken for an hour or more; whilst the action of one which is intended to cause a revulsive effect is kept up only for fifteen or twenty minutes. The continuance of the bath must be abridged in cases where the debility of the patient forbids it to be long. Upon the whole, the good and chief effect has been obtained when the foot grows very red, and its swelled veins feel like knotted cords beneath the skin, and roll from under the fingers. The congestion in the vessels continues for some time after the immersion, when it gradually disappears.

STIMULATING PEDILUVIA.

The Sinapised Foot-bath.

Aquæ Calid. (45° centigrade) ℔viij. Farin. Sinap. ℥iv. M.

The Alkaline Foot-bath.

Aquæ Calid. q. s. Potass. Sub-carb. ℥iv. M.

The Acid Foot-bath.

Aquæ q. s. Acidi. hydro-chloric. ℥ij, ad ℥iv. M.

MANULUVIA.

The degree of the temperature, the composition and mode of acting of hand-baths, are the same as in the foot-bath; and they are sometimes employed, in preference to the latter, in chronic diseases of the heart and lungs. The irritating substances which are added to them are proportioned in the same doses, according to the quantity of liquids used, as for the foot-baths.

Some partial baths besides these are often used for subduing local inflammations. The fluid selected is generally a decoction of flax seed, or of the roots of the mallow. The hand and fore-arm are bathed in any convenient vessel of a suitable size; and the penis and testes, when inflamed, are often subjected to a similar treatment.

THE SAND BATH.

Sand baths are locally applied for slightly stimulating parts which are œdematous; and particularly to obviate chilliness of a limb after the performance of ligature of its principal artery. The sand, warmed to a temperature equal to that of the human body, is put into small bags, of which cushions resembling those used for fractures are made; and with these cushions the limb is covered. Instead of sand, rags, cotton, hair, &c. may be used; indeed, every soft substance which is dry, and a bad conductor of heat, previously raised to the required temperature, may be substituted for it.

GARGLES.

Such is the name of a local bath, which is applied to the velum palati and the fauces. The diseased part which in all other baths is passive, in this becomes the seat of active contraction. It is indeed necessary, in order to avoid swallowing the gargle, which would sometimes be rather unpleasant, that the base of the tongue by a long sustained contraction be kept applied against the pharynx posteriorly. Then, by bending back the head, the fluid becomes in contact with the velum, the palatine pillars and the neighbouring posterior wall of the pharynx. But breathing and gargling cannot be simultaneous; and the contraction, moreover, of the pharynx is very painful, and therefore persisted in with difficulty, and irritating in its effects, when these parts are the seats of an acute inflammation. A gargle must consist, consequently, of a series of applications of a liquid which are successively rejected; and admit of intervals during which breathing may be allowed to be performed, and the muscles that contract on the exhibition of the fluid, to repose. In this respect, then, a gargle is only a succession of ablutions.

All medicinal properties may be communicated to gargles. Their mode of action is similiar to that of poultices.

FORMULÆ FOR GARGLES.

No. 1.—*Emollient Gargle.*

Decoct. emollient. ℥iv. Syrup. Mellis ℥ss. M

This is used instead of a poultice in the acute stages of inflammation, about the velum and pharynx.

No. 2.—*Astringent Gargle.**

Decoct. Hordei ℥ii. Decoct. Rosar. Gallic. Decoct. Rad. Punic. Granat. aa. ℥j. Mell. Rosar. ℥ij. M.

It is useful in the decline of a cynanche for slightly astringing the swelled and softened mucous membrane, and the œdematous submucous tissue; in all cases, in fact, in which we dread that the affection is verging to chronic inflammation.

No. 3.—*Stimulant Gargle.*

Decoct. Astringent. ℥iv. Mel. Rosar. ℥j. Acidi Acetici, q. s. vel Acidi Sulphur. aut Hydro-chloric. gtt. xv. M.

Of this a frequent use is made in gangrenous sore throat; and also to re-excite tissues in a state of chronic inflammation, particularly when exhaling fetid odours.

No. 4.—*Anodyne Gargle.*

Decoct. Emollient. ℥iv. Syrup. Mellis, ℥j. Tinct. Opii, (Rousseau's) gtt. xv. M.

No. 5.—*Antisyphilitic Gargle.*

Gargarism. Emoll. ℥iv. Hydrarg. Bichlorid. gr. j vel. ij. M.

It is used as a local application where there is syphilitic ulceration on the velum pendulum palati.

DOUCHES, OR THE WATER DASH.

The word "*douche*" means a jet of fluid which is allowed to strike upon a part. The water-dash, according as the shock proceeds from above downwards, from one side, or from below upwards, is said to be descending, lateral, or ascendant.

The temperature of water-dashes varies; there are some warm and some cold. The composition of the fluid also is as diverse as that for bathing. The third way in which douches act, is by percussion; and this is the chief distinctive mark between them and baths. To administer a water-dash, a lofty reservoir is necessary,

* A more powerful formula for a similar purpose, and in relaxation of the uvula, is the following: Pulv. Cort. Querci. Rob. ℥ij. Alumin. Sulph. gr xx. Acid. Sulph. gtt. xx. Aq. Bullient. ℥vj. Misce et Cola. (Rennie's Pharm'a.) —*Trans.*

which contains the liquid, and from whence it descends by means of a cock or spout; a tub or a barrel answers the purpose very well. The impetus of the descent is proportionate to the elevation of the column of water in the reservoir, or to that of the point from whence the water flows. In the lateral and descending dashes, the gush of liquid is effected in two ways; when a very smart shock is required, the water is made to issue in a single stream from the opening of the spout; the diameter of this orifice being from two lines to one inch. If, on the other hand, we desire to subdue the force of the percussion and cause the fluid to spread itself upon a larger surface, we affix the rose of a watering-pot to the cock, whence the water descends in the form of a shower.

The patient who is to undergo the water dash, is seated in a bathing tub, which when the dash is cold, is filled with tepid water; but on the contrary, when that is given warm, the tub may be at first empty, and will fill itself with fluid as the jet descends. When we observe the process which goes on upon a part subjected to a water-dash, we perceive that there occurs upon it a depression correspondent to the weight of the column of liquid; the blood being driven back by the pressure, the skin at the point of contact is white, and of a vivid red around its circumference. The operation being over, the redness becomes general; its intensity is in equal ratio with the power of the shock, the degree of temperature, and the qualities of the liquid, whether irritant or otherwise.

Warm-dashes, besides the rage for their employment, and some special applications for medical purposes, are frequently used in surgery, when lateral or descending. The stimulant effect of mere percussion or affusion is increased by the qualities of substances dissolved in the liquid. For this purpose, saline or sulphurous waters are chiefly employed. The diseases in which their agency is most often exerted, are false anchyloses, chronic congestions especially of fibrous tissues, gouty pains, psoric and herpetic affections, &c.

The ascending dash differs from the two others, in being administered by means of a tube of small dimensions, so curved as that its orifice shall be turned upwardly. Into this the water flows, either supplied from a little reservoir, or driven onwards by a forcing pump. The opening in the tube is but a few lines in diameter, and the jet ought not to be rapid. This dash is made almost always with either cold or tepid pure water. Its uses are to dilate the anus gradually in obstinate constipations attended with a retention of

fœces; for promoting the resolution of chronic congestion about the cervix uteri; in leucorrhœa; and for the cure of vesical catarrh. M. Jules Cloquet, who has derived good effects from it in the latter case, has ascertained that distilled water is better for the purpose than even emollient medicated liquids.

INJECTIONS.

Injections are jets of fluid which are made to flow into the interior of cavities, either natural or accidental. They are thrown into the meatus auditorius externus, the urethra, and bladder; into the rectum, when the especial name of clyster, or *lavement*, is given to them, and they are used to fulfil several indications; and into the tunica vaginalis in cases of hydrocele, the puncta lachrymalia in tumefaction of the mucous membrane of the ducts, fistulous passages, purulent sinuses and abscesses, and cysts of different kinds.

There are three ends which we propose to ourselves in the use of injections: first, to wash and cleanse surfaces which it is difficult to reach from their depth; the fluid in such a case being only pure water, or some emollient decoction; the injection, as it returns from the cavity, brings along with it the pus or foreign bodies which it was designed to remove; secondly, to establish an inflammation in a cavity, which, assisted by the reapproximation of its parietes, shall tend to favour its adhesion. This indication is answered by imparting to the fluid used, properties of a more or less stimulating kind. Into the vaginal tunic of the testis, and into the cavity of various cysts, upon this principle, we inject port wine, in which a decoction of Provins roses has been made; thirdly, we use injections, in the last place, as a means of conveying medicines to a great depth; in which case, the fluid acts merely as a vehicle holding in solution or suspension therapeutic agents which are in unison with the kind of medication we wish to effect; of which third end of injections, narcotics in chronic induration of the neck of the womb offer an illustration.

Injections are given with a syringe whose calibre is in proportion to the extent of the cavity which is to be filled with the fluid, or to that of the surface which is required to be cleaned. The injecting syringe for the lachrymal passages, the urethra, fistulous passages, &c., holds only two ounces of fluid; that which is used for the bladder or vaginal tunic, is capable of containing six or eight ounces. Before the syringe is used, we ought always to be certain that the

piston fits the cavity of the barrel so exactly as that no air can enter it. We then fill it, either by plunging the end of the pipe into the fluid, and slowly withdrawing the piston; or else by removing it entirely, and replacing it after having poured the matter of injection into the cavity of the syringe. All the air which may have entered is expelled by turning the pipe upwards, and slowly forcing on the liquid until it appears at the orifice. Then taking the syringe between the fore and middle fingers of the right hand, the thumb being encircled by the ring which is placed at the external end of the piston, we direct its point, if the place to be filled be an abscess with a large outward opening, towards the spot upon which the stream of fluid is to bear; but if the external aperture, on the contrary, be very narrow, we begin by passing the pipe gently into the cavity which we have to fill. In the latter event, and when it is desirable to irritate the sides of the cavity, the fore and middle fingers of the left hand are applied upon the orifice of the parts, and prevent the regurgitation of fluids outwardly, and, after the syringe is withdrawn, they oppose its exit for some minutes. When the injection is performed through the medium of a canula previously introduced into the cavity, its mouth is held firm by the fore and middle fingers, whilst the exit of the injected liquid is obviated by the application of the thumb upon the orifice.

Formulæ for Injections.

No. 1.—Emollient injections are chiefly made with suitable decoctions, and principally with those of flaxseed and mallows root.

*No. 2.—Stimulating Injection.**

Fol. Rosar. Provins. ℥ij; boil in Vin. Oport. ℔j.

This injection is employed for inflaming the tunica vaginalis after puncture for hydrocele, the interior of cysts, fistulæ, &c. and for making their sides adhere.

No. 3.—Exciting and Resolvent Injection..

Aquæ Distillatæ, ℔j. Sulphat. Zinci, gr. xxx. M.

This is used twice a day in blennorhagiæ which are verging to a passive state.

There are recorded a few cases in which sulphate of zinc was administered successfully as an injection in enormous doses, and in solution in liquids themselves of an irritating nature. In these cases there occurred an active inflammation in the part, which required

* An excellent injection for fistulous ulcers, is the following: R. Argenti Nitras. gr. ij. Aq. Distill. ℥j. M.—*Trans.*

an antiphlogistic treatment; and the patient was cured after two or three similar injections. It would, in our opinion, be imprudent to have recourse to this measure, upon the advantages and objections of which experience is not yet sufficiently decided.

*No. 4.—Anodyne Injection.**

Decoct. Emoll. ℔j. Extracti Opii, gr. xv. M.

This is injected several times a day, to assuage the pain of blennorrhagia in either sex; and it is likewise useful in congestions about the neck of the uterus.†

FUMIGATIONS.

Fumigation consists in converting a solid or liquid body into vapour, by means of heat; or in the disengagement of gases by appropriate chemical process. The name is also given to the gases or vapours themselves which are used for the cure of diseases.

The substances or compounds of which fumigations are made, act, some of them by themselves, and serve also as vehicles for others; such are ethers, water and alcohol. Others, naturally volatile, need no excipient; of which number are various gases, chlorine among others; and some substances, such as sulphur and cinnabar, which are solid at the ordinary temperature of the atmosphere. Some, lastly, such as aromatic principles, are dissolved in some liquid the vapour of which acts as a vehicle for them.

Fumigations vary in their properties by reason of their temperature, according to the nature of the substances which are sublimed, and to the substances being, or not being mixed with aqueous vapours.

Very hot fumigations redden the skin, exclusively of any properties in the vapours of which they are composed. Dry fumigation induces abundant sweating, and owing to the abstraction of caloric which is attendant upon evaporation, may be endured at a very elevated temperature; when very moist on the contrary, it induces a turgidity in the cuticular texture, extreme itching, and a sensation of penetrating heat which becomes speedily insupportable. This latter effect is owing to an absence of the evaporation of sweat in an

* An anodyne enema, employed in allaying pain from cancer of the rectum, &c. is made thus. R. Amyli. q. s. Aquæ. ʒij. Mix them and boil them, and add, Tinct. Opii, gtt. l. vel.c. To be injected at a moderate heat. —*Trans.*

† A good form of nutritive enema, for sustaining strength in certain dysphagic and other affections, is—Jusculi bovini, ʒxij. Stir into it Farinæ. Mar. Arund. q. s.—*Trans.*

atmosphere which is already loaded to saturation with moisture. Fumigations which are used a little below the heat of the human body in their temperature, become relaxing, particularly when moist and impregnated with emollient vapours.

Fumigations are employed in a great number of diseases; when made with emollient decoctions of mallows, milk, &c., they are advantageous in inflammations of the skin and mucous membranes; and of these, in those particularly of the nose, pharynx and air passages.

Although the astringent principles, tannin and gallic acid, are not easily volatilized, and then but in small quantities only, they, or such medicines as contain them, are nevertheless successfully used for fumigations in chronic inflammations of mucous tissues, particularly when attended with relaxation, as in the vagina and anus, or when they are the seats of long standing discharges.

Here, as is the case with all topical remedies, the very numerous class of medicines which act as excitants or stimulants, contain substances of very various qualities, and whose proximate effect, irritation, is attended and followed by very different phenomena. The only effect in common, for example, between the action either of acids, ammonia, ethers, essential oils, sulphur, cinnabar, calomel, &c., employed in the state of vapour, is irritation upon surfaces with which they come in contact. Fumigations with these articles should be made in closed apparatuses, as all of them, or nearly all are likely to induce serious inflammation in the mucous membrane of the lungs, if inhaled. As it regards the particular application made of each individual among them, fumigations of chlorine and the acids have been made to ulcers in a state of sphacelus or attacked with hospital gangrene, but with no great success; those of the bi-sulphuret, and proto-chloride of mercury to chronic venereal ulcers, and particularly to those situated in the nasal fossæ and on the velum palati, and with better results; but in this case care must be taken that the vapour strikes nowhere else than upon the affected part, and the patient should be directed to let the access of the vapour alternate with his inspirations, so that each time that he desires to breathe, he begins by expelling the air which is loaded with the materials of fumigation before he inhales a fresh quantity into his lungs. Fumigations with sulphur or sulphuric acid, are proper in tetter and the itch; the latter being the more active, but the most irritating. Finally, such as are made with amber, essential oils,

balsams, alcoholic solutions, &c., are beneficially employed in cases of œdema of the integuments, or in diseases connected with atony.

Anodyne fumigations are used dry, and proceed from the smoke resulting from the burning of the leaves of hyoscyamus, belladonna, &c.; or moist, when the vapour of a decoction of these plants is employed. They are useful in neuralgia and nervous diseases. When made to act upon the intestinal canal, they allay ileal colics; and when inhaled, have sometimes even succeeded in preventing or cutting short an attack of convulsive asthma.

Fumigations are administered in different ways. The best procedure is that where a very well closed wooden box is made use of, in which the patient sits; his head passes out through a kind of apron of leather or varnished silk, which fits very accurately around his neck, to prevent the escape of any vapour. The disengagement of the latter is effected, either within the lower part of the apparatus, in which the substances to be sublimed are volatilized upon an iron plate intensely heated; or else at some place more or less distant from the fumigation box. The vapours are subsequently conducted by tubes to within the cavity of the apparatus. The latter is a very convenient method, inasmuch as in cases in which the patient cannot rise, fumigation may be administered to him in bed. In order to effect this, the bed clothes are upheld by spiders, as in cases of fractures; and it is well to enclose the patient in a bag of oiled silk, within which the vapour is introduced. But for this precaution, the sheets may become impregnated with the smell of the fumigation, which is more or less dangerous according to the materials of which the remedy is composed; or if there be moist vapour in the fumigation, the bed may contract dampness which might be fatal to the patient, particularly in cold weather.

To arrange the apparatus is extremely simple. At some distance from the bed stands a chafing dish upon which is placed some vessel having a beak, say a coffee-pot or any thing else, hermetically closed at the top, and containing the substances intended for sublimation. Were the substance to be sulphur, the heat should be so managed as to avoid its inflaming, and, for greater security, it would be advisable to warm it in a sand bath. To introduce the vapour into the bed, we adapt to the vessel a long pipe made from a hollow reed, an elder berry stick, a leather leader, or any such thing, which shall open into the oiled silk bag. It is better that the point of union between the tube and bag should be made of some solid

canal, either wood or metal, so that the edges of the opening in the bag may be drawn over and fastened upon it with pack-thread.

I have often successfully resorted, as a substitute for the fumigation box which one has not always at hand, to a common bathing tub, in those cases in which the remedy was effected with vapour of water, either alone, or holding as a vehicle some principle in suspension. A wooden frame like a gridiron rises from eight to ten inches above the bottom of the tub, formed of longitudinal strips of wood joined by cross pieces; this frame is supported by wooden legs of a suitable thickness. Then by pouring in water at about 70° centigrade, to a height of about three inches from the floor of the tub, the vapour fills its cavity. The patient being placed in a sitting posture upon the frame, is consequently about six inches above the level of the water; then throwing over the bathing tub a thick sheet folded in half and a counterpane, he covers up his neck in such a way as to leave nothing out but his head, and is to all intents and purposes in a vapour bath. I have always perfectly succeeded with this simple contrivance. It is evident, that it may always be substituted for the usual fumigating bath, and that whatever be the kind of fumigation which we wish to administer, it is easy, by means of pipes adapted to a hole in the tub, to introduce within it any kind of vapour whatever.

Local fumigations to internal cavities, such as the ear, fossæ nasaliæ, air passages, vagina, and rectum, are effected by means of a three necked bottle; one neck serves for the introduction of the materials for composing the fumigation; the centre one allows the external air to press upon the surface of the liquid, and the third has either a neck or a tube attached to it, which is introduced into the cavities, or is placed between the lips when the vapour is intended to be inhaled. A still more simple apparatus is constructed, by adapting to the top of a vase which narrows at its upper part a pyramid of thin pasteboard, the base of which fits like the open end of a funnel upon the vessel, whilst the other end is introduced as it is, or fitted with some additional adjustment into the natural aperture to which the fumes are to ascend.

Lastly, in cases in which it is requisite to impel the vapour with considerable force, and the fumigation is a dry one, the fumigating bellows are employed. This is an instrument to the end of which a little box in which the combustion goes on is attached; the air expelled from the bellows drives the vapour before it. For wet

vapours, a similar apparatus of the most simple construction may be contrived; the pipe of a common bellows needs only to be introduced into the small opening of the pyramid just mentioned, and almost parallel to its direction; then, by working the bellows, the column of air will drive the vapour before it, and a true injection will take place.

FORMULÆ FOR FUMIGATIONS.

Emollient Fumigation.

R. Decoct. Calidiss. Farin. Lini, vel. Rad. Althear. q. s. Add at the time of administration Flor. Sambuc. ℥ss.

It increases mucous secretion in coryza, angina, and pulmonary catarrh. The vapour ought not to be breathed when very hot.

Mercurial Fumigation.

R. Sulph. Hydrarg. Rub. Gum. Olibani, aa. ʒij.

This vapour when directed upon ulcers and eruptions of a venereal character, should not, more than it is possible to avoid, be allowed to escape into the open air.

We have yet to speak of those fumigations which are called *disinfecting;* whose object it is to decompose miasmata which are in suspension in the atmosphere. They are effected either with chlorine gas or with nitric acid. The former is called the Guytonian, from the name of its discoverer, Guyton de Morvau; the invention of the other belongs to Dr. Carmichael Smith.

The theory of the modus agendi of these fumes is grounded upon the fact, that the basis of deleterious gases and miasms, originating from the decomposition of animal and vegetable matter, is hydrogen. The chlorine, by seizing on the hydrogen to form hydro-chloric acid, destroys the combination; and the bodies with which the hydrogen was in union return to a free state, or form mutually new and inodorous compounds. Chlorine is of all our purifying agents the most efficacious, and the most worthy of reliance; no injurious exhalation can withstand its influence; and it deserves in every case a preference, not merely over the fumes of evaporated acetic acid, the burning of sugar, balsams, resins, &c. which are means wholly insignificant, and do no more than conceal one odour by the substitution of another, but even to nitric acid itself. This latter agent decomposes nearly all deleterious gases, generated by the putrifying of animal and vegetable remains, by giving up oxygen to their carbon and hydro-

gen, or to any other substance according to the constituents of the compound. In the first case, we have a formation of carbonic acid; of water, in the second; and in the others, products more or less varied, in addition to azote, and the compounds into which it enters; such are nitrous acid, ammonia and its carbonates, prussic acid, &c.

THE METHOD OF MAKING DISINFECTING FUMIGATIONS.

The Guytonian Fumigation.—(*Pharmacopœia.*)

First Procedure.

R. Chlorid. Sodii Pulv. 7 parts; Manganes. Peroxyd. 1 part; Aquæ Commun. 4 parts; Acidi Sulphurici (at 66°), 4 parts, by weight.

The first three articles are mingled in a glass or glazed earthen vase; by pouring the acid upon them, and stirring them with a glass rod, the gas comes over abundantly.

This procedure is proper, when we desire to obtain a large quantity of chlorine in a short time, to purify the air of an hospital ward, or an apartment which is highly vitiated. We close carefully every door, window, or aperture whence the gas might escape, then make our mixture, and withdraw. The air is in a half hour, or at most an hour, entirely disinfected. Upon re-entering the chamber, we should hold our breath until we have opened the nearest window, lest the chlorine, which is in excess, be drawn into the lungs, where it produces violent irritation and cough. We then shut the door, and until all the gases have disappeared and the room is again full of atmospheric air it is not to be re-inhabited.

Second Procedure.—If a slow and scanty generation of chlorine gas only be required, the following formula had better be acted upon than the preceding.

R. Acid. Hydrochloric. concent. 5 parts; Peroxydi Manganes. 1 part.

The Manganese is placed in a wide mouthed vessel, and the acid is poured upon it in small quantities at a time, the mixture being frequently shaken. By this means we are enabled to remain in the chamber in which the fumigation is going on, if the windows are left open. It is of convenient application in the wards of hospitals, and in anatomical theatres, &c. So soon as the chlorine, which is easily recognisable by its pungent odour, comes over in excess, the vessel is taken away.

In very large wards, in which the air is not extremely vitiated, or when circumstances do not allow of their being emptied, we carry about the vessel whence the chlorine issues, or else several of them

are set about in different places; but care must be taken that the quantity disengaged is never sufficient to inconvenience the patients.

Dr. Smith's Fumigation.—(*Pharmacopœia.*)

R. Acid. Sulphur. 66°, 2 parts. Aquæ, 1 part. Potass. Nitrat. puriss. in pulvere trit. 2 parts. M.

Mix the acid and the water, and wait until the heat which follows the commingling has subsided. Then gently raise its temperature upon hot ashes, or in a sand-bath, and throw in the nitre in small quantities, frequently renewed. The nitric acid gas comes over in this way without any admixture of nitrous gas.

The same precautions are demanded in the use of this fumigation, as in that of the one just described.

LINIMENTS AND EMBROCATIONS.

Liniments are medicines which are either spread, or with which frictions are made upon the surface of the skin. By their etymology, which is derived from *linire*, they are supposed to soften; an idea suggested by the effect of the oils which compose their bases. However, as a preference is often given to oils of an acrid character, and as irritating as well as other substances often enter into the composition of liniments, the object of this class of remedies most usually is to besmear and anoint parts, to act as frictions, and to cause an adherence of therapeutical agents upon the skin, by which the sensibility of that tissue may be modified, or from which the medicinal principles may be absorbed. Narcotic and purgative liniments particularly are prescribed with this view.

When, however, a principal object is the absorption of a remedy, liniments are not so good as watery applications, because of the oil in them which closes the pores of the skin; besides which there are but few substances which are soluble in an oleaginous vehicle.

All kinds of medicinal virtues are imparted to liniments; emollient, astringent, narcotic, and the like. The efficient principles are chiefly incorporated under the form of powder, tincture, extracts, or are dissolved in some fatty matter. The mild fixed oils are selected when a sedative and relaxing effect is required, whereas when it is desirable to effect irritation, rancid or acrid ones are preferred.

Liniments are usually applied upon the affected part, or else opposite to the disease which we intend to relieve. As mere inunctions they are but little used, but always, on the contrary, as frictions, which when the liniment is relaxing, are made gently, and with

greater or less rapidity when the remedy is to irritate. The materials entering into its composition being for the most part in suspension only, and therefore separating by repose into distinct strata, according to their specific gravities, we must when going to use a liniment, shake the vial in which it is contained to render the liquid homogeneous; then we pour out a little into the hollow of the hand, or upon a piece of flannel or linen, warm it a little before it is applied to the skin, and then make the friction. This being done, the parts are wiped, and warmly wrapped up.

The re-application of liniments is determined by the urgency of the indication to be fulfilled. If we design merely to soften the skin, or to effect the absorption of a medicine, their use is discontinued as soon as the end proposed is obtained; but in much the largest number of cases the remedy is employed in tedious diseases, such as paralysis, and affections of the joints, in which cases the application ought to be renewed twice or three times a day, and the part rubbed be washed from time to time with soap and water for the sake of cleanliness, and to prevent the formation of a coating of fatty matter, which by its adhesion to the skin might prevent its action, and through which the new applications not penetrating, they would be rendered of no effect.

Properly speaking, an *embrocation* is but one form of liniment, of which olive oil is usually the basis. The name has been extended to mucilages, but owing to embrocations being tepid when used, the latter is in fact merely a fomentation.

The oil which serves as the basis of an embrocation may be simple, or impregnated with some sedative or aromatic principle, such for instance as camphor, the essential oils of chamomile, lavender, rosemary, &c. To apply an embrocation, the oil is warmed and lightly spread over the parts, which are then covered up in cloths or flannel. The effect is to relax and produce slight irritation; it must be often renewed, and requires the same attention to cleanliness as liniments.

FORMULÆ FOR VARIOUS LINIMENTS.

No. 1.—*Anodyne and Resolvent Liniment.*—(*Baron Dupuytren.*)

R. Olei Lilior. ℥vj. Sapon. Alb. ʒij. Ext. Hyoscyami, ʒss. M.

Applied to painful congestions, chiefly in chronic inflammation of the joints.

No. 2.—*Camphorated Volatile Liniment.*—(*M. Dubois.*)

R. Ol. Olivar. ℥iv. Gum. Camphor. ℥ij. Aquæ Ammon. ℥ij. M.

Used as a friction to produce resolution in indolent tumours, and along the spinal column as a stimulant to rachitic children.

No. 3.—*Phosphorated Liniment.*

R. Ol. Amygdalar. Dulc. ℥vj. Phosphori, in fragmentis, gr. x. M. Solve in oleo, temperante calore.

This formula, applied by frictions, has succeeded in relieving long standing cases of rheumatism and paralysis.

No. 4.—*Antispasmodic and Evacuant Liniment.*

R. Ungt. Althear. ℥ij. Gum. Camphoræ, Laudan. Liquid. aa. ℥j. M.

Applied by gentle frictions or as an embrocation upon the epigastrium or umbilical region, in gastralgia and nervous colics, upon the course of nerves affected with neuralgia, and in short upon all all parts acutely painful.

No. 5.—*Chilblain Liniment.*

R. Bals. Peruv. ℥ss. solve in Alcohol. ℥iv; deinde adde, Tinct. Benzoes. ℥ss. Acid. Hydrochloric. dilut. ℥j.

To be rubbed on the affected parts several times a day.

No. 6.—*Mercurial Liniment.*—(*Venereal Hospital.*)

R. Ol. Olivar ℥j. Ammoniæ, Ungt. Hydrarg. Fort. aa. ℥j.

Used for favouring the resolution of syphilitic tumours.

OF CERATES, POMATUMS, OINTMENTS, AND PLASTERS.

Beneath these various denominations are comprised medicines made up of grease, oil, wax, balsams or resins, which are blended with powders, extracts, metallic oxides and salts.

These remedies vary in properties with their composition, consistence and the virtues they possess. Some of these ointments, &c., owing to the number of their ingredients, and the stronger or more feeble affinities which exist between them, are merely mixtures of the articles employed; others again are true chemical compounds in which the articles have each lost more or less of their original properties, to invest the newly formed compound which results from the mutual reaction of their elements, with other and specific qualities.

Medicinal fats and plasters are, according to their composition, remedies of a relaxing, sedative, resolvent, narcotic, and particularly of a stimulating nature. A great advantage of these preparations is that they can be kept a long time, without undergoing any altera-

tion in their properties. The length of this time, which depends upon the degree of consistence and intimacy of incorporation of the elements, is greatest in plasters, some of which will keep for years, whilst cerates and pomatums which soon grow rancid and are decomposed, require to be prepared more often.

OF CERATES.

Cerates are mixtures of oil and wax to which are added different medicinal agents for producing different effects; they are of about the consistence of honey.

No. 1.—*Cerate of Galen.*—(*Pharmacopœia.*)

R. Ceræ flavæ vel albæ, four parts. Ol. Olivar. vel Amygdalar. Dulc. six parts. Melt the wax in the oil at a gentle heat in an earthen vessel, stir it until it cools, and add gradually, Aquæ, twelve parts.

This is a cerate constantly used in surgery, for guarding wounds and ulcers against the direct contact of lint and compresses; when spread upon strips of linen or upon cushions of lint, it prevents dry dressings from sticking to the surface of sores, &c. It softens and renders the skin pliable, and in this respect is peculiarly suited to chaps, and for making inunctions and frictions; it is used as the excipient of a variety of medicines, and forms compound cerates; such for example, as the following:—

No. 2.—*Goulard's* (*Resolvent*) *Cerate.*—(*Pharmacopœia.*)

R. Cerat. Galen. ℥ij. Plumbi Acetat. liquid. (alias Extract. Saturni,) gr. x.

Used in cases of burns, tetters, and to the surface of ulcers in an atonic state. Its effect is slightly stimulating, and also astringent.

No. 3.—*Cerate of Cinchona* (*Tonic*).—(*Pharmacopœia.*)

R. Cerat. Galen. solut. temp. calore, ℥ij. Extract. Cinchonæ, solut. in Spt. Vini, Rect. dilut. ℥j. Rub it up and mix intimately.

This is employed for the purpose of increasing the activity of the capillary circulation.

No. 4.—*The Opiated Cerate* (*Narcotic*).

R. Cerat. Galeni, ℥ij. Tinct. Opii, (Rousseau's) ℥j. M.

Used in all cases wherein pain and pruritus are to be allayed.

No. 5.—*The Mercurial Cerate.*—(*Venereal Hospital.*)

R. Ungt. Mercurial. ℥ij. Cerat. Simp. ℥v. M.

Used in the dressing of syphilitic wounds and ulcers.

No. 6.—*The Sulphuretted Cerate.*—(*M. Alibert.*)

R. Cerati, ℥iv. Flor. Sulphuris, ℥j. Ess. Limon. q. s. M.

Applied by gentle frictions in tetter and other cutaneous diseases.

No. 7.—Belladonna Cerate or Pomatum.

R. Ext. Belladonnæ, ʒij. Aquæ Distill. ℥ij. Mix and rub up with Cerat. ℥ij.

For the composition of this pomatum we are indebted to M. Chaussier, who has derived advantage from its use in dilating the os tincæ during labour. He employed for its application a small syringe, the pipe of which was of a diameter sufficient to admit the tip of the finger; by pressure upon the piston he injected the remedy to the amount of two drachms. The use of the syringe is evidently not so indispensable, but that a hollow tube through which a linen rag spread with the pomatum is introduced, cannot be substituted for it.

OF POMATUMS.

This form of medicament differs from cerates only in that any fatty substance whatever, may serve for its excipient; this most commonly however, is hogs' lard, butter, or simple cerate itself. From this it follows that all cerates are pomatums, whilst a pomatum is a cerate only when a mixture of oil and wax is used for its excipient.

Another characteristic distinction between the two words, is that a cerate may exist as such when no accessory substance is added to it, whilst a fatty body can be entitled to the appellation of a pomatum only when it is combined with other articles.

Pomatums have the same degree of consistence as cerates. Their composition is singularly various; some are made by merely adding an essential oil to some fat substance, which is commonly beef's marrow; these are employed wholly as cosmetics, with which we have nothing to do. Others made up of a greater or less number of remedial agents, constitute standing applications, under the form of frictions and of ointments.

It is needless to offer examples of pomatums as it regards their medication, as that has been already done in the section on cerates. We shall present our readers, however, with a few useful formulæ for fulfilling certain particular indications.

Opthalmic Pomatum.—(Baron Dupuytren.)

R. Axungiæ Porcinæ, ʒij. Ox. Hydrarg. Rub. gr. x. Zinci Sulph. gr. xx. M.

This prescription is very useful in scrofulous persons, labouring under chronic opthalmia. In using it, the pomatum is lightly spread over the edges of the eyelids with the feather of a quill, or a camel's hair pencil.

Epispastic Pomatum.—(*M. Marjolin.*)

R. Pulv. Cantharid. ʒj. Aquæ ʒxij. Coque ad ʒvi et adde, Axung. Porcin. ʒvi. Ol. Olivar. Ceræ Albæ, aa. ʒiv. M.

Boil them together, stirring the mixture frequently until the water is evaporated; strain it and let it stand to cool and deposit; then add, Camphor. Pulv. ʒij.

This pomatum is excellent for keeping up the discharge from fonticuli, blisters, &c., without acting too violently or extending its action to the bladder.

Autenrieth's Antimoniated Pomatum.

R. Axung. ʒj. Antim. et Potass. Tart. ʒj. M.

With a quantity of this ointment as large as a common sized nut, frictions are instituted and renewed twice or three times a day. The more common spot for their application is over the stomach. They give rise to the production of a crop of pustules resembling those produced by inoculation. This remedy, which acts as a derivative of great power, is successfully used in whooping cough and obscure affections of the chest.

Iodine Pomatum.—(*M. Biett.*)

R. Prot-iodid. Hydrarg. ɔss. Axungiæ, ʒiss. Ess. Bergamot. gtt. xv. M.

The author has seen large syphilitic ulcerations, which had resisted every other means, quickly disappear upon the exhibition of this pomatum.

A previous pomatum in which the deut-iodide of mercury was a component, appeared to demand much caution in its use, owing to the extremely energetic action of the preparation. The formula now offered has no other objection than that it is sometimes followed by ptyalism.

OF OINTMENTS.

No where is the vagueness and confusion which has prevailed so long in pharmacy and the materia medica more conspicuously demonstrated, than as it regards the true acceptation of the word unguent. Its etymology, which is derived from the latin verb *ungere*, indicates that it is a medicament for the anointing of parts, whereas of the numerous compounds which formerly passed under this name, there are many which, owing to their consistence, could never be applied to any such purpose.

Of later years attempts have been made to reconcile the chaotic incongruity of ancient nomenclature, and it has been settled that

those compounds shall be known as ointments which contain resin or essential oils, are of soft consistence, and capable of liquefaction at animal temperatures. They differ from pomatums in containing resin, which the former do not; and from plasters, because those preparations contain, besides a larger proportion of resin, a metallic oxide also. The remedies formerly called grey ointment, citrine ointment, &c., which contain only fats or fixed oils, are now included among the class of pomatums; and among that of plasters, are comprised the compounds of resin and metallic oxides, which require some considerable heat for their liquefaction.

Ointments possess, for the most part, irritating properties of more or less power, according to their various ingredients. They are applied either upon the integuments, or else upon the surfaces of solutions of continuity, spread upon leather, lint, or linen. Their exhibition was once immoderately resorted to; but now that experience has convinced us that all applications of this kind do but irritate sores and ulcers, and unnecessarily retard their cure, they have fallen much into disuse. They are now employed but in a few very rare cases, in which it is necessary to produce a more active condition in certain atonic ulcers.

The following are a few of the ointments, of which most frequent use is made :—

Digestive Ointment, or the Balm of Arcæus.

R. Sevi Ovilli, ʒj. Tereb. puræ, Resinæ Elemi Puræ, aa. ʒvj. Axung. ʒiv.

Liquefy the whole together, and strain it to make an ointment, which is of use to stimulate chronic ulcers. It may be rendered less stimulating by mingling and beating up a small portion of it in the yolk of an egg and some olive oil. If the spot upon which it is to be laid is acutely painful, the ointment may be rendered anodyne by triturating and intimately mixing with it a sixteenth part of its weight of gum. opii reduced to a powder.

The White Camphorated Ointment.—(*Vienna Pharmacopœia.*)

R. Adipis Suillæ, ʒiij. et ʒvj. Plumbi Subcarb. ʒi et ʒvij. Liquefy the lard; add the ceruse in powder, mix it well and stir it over the fire until it assumes the consistence of an ointment; then add, Gum. Camphor. pulv. ʒj.

This is a repellent ointment; it is applied to burns, sprains, and bruises.

Epispastic Ointment.

R. Ungt. Basilic. Ungt. Populci, aa. ℥j. Pulv. Cantharid. gr. xviij.

Mix them by trituration.

It keeps up suppuration in artificial drains, but proves more irritating than the pomatum for the same purpose previously described.

Basilicon Ointment.

R. Picis nig. Colophoniæ, Ceræ flavæ, aa. ℥iv. Ol. Olivar. ℥ij.

Melt together the pitch and colophony; to the mixture add the wax and oil, and stir them until the combination is complete. Strain it and triturate the mass until it is only just tepid.

This ointment frequently enters as an ingredient into the composition of others; and is often mingled with maturating poultices.

OF PLASTERS.

We have seen that the chief difference between unguents and plasters is that the latter hold in them a larger proportion of resin combined with a metallic oxide. The compound is now a mere mixture no longer, but a chemical combination whereby the oils and greasy matters are rendered solid by the metallic oxide. The degree of consistence, the temperature at which the plaster fuses, the more or less intimate conjunction of elements, and the want of a metallic oxide, together with great tenacity or adhesive power, has caused the establishment of an intermediary distinction between plasters properly so called and ointments. The preparations which hold this middle place, are called emplastic-unguents. It is not, nevertheless, our intention to separate them in our remarks upon the subject of our article.

Fatty substances being composed of carbon, oxygen and hydrogen, it is easy to conceive what sort of action they induce with oxides. They tend to acidify by means of the oxygen which those bodies contain, either by effecting their reduction to a metallic state, in which case no combination is produced, or else, which is what occurs in plasters, by diminishing the degree of their oxidation, and by combining themselves with the newly formed oxide. The arbitrary chemical proportions according to which these bodies are placed in contact, cause the fatty substances to be always found in great excess when compared with the quantity of the metallic oxide, and there is always a portion of the grease which does not combine with it; this portion remains free, but acquires siccative properties.

The action of different oxides does not take place to a similar

extent. That of oxides of iron is scarcely appreciable. Oxides of copper enter into combination very slowly; those of mercury and bismuth are much more easily incorporated, but the compounds which they form with fats seldom acquire much consistence. The most solid of all are those made with oxides of lead, and litharge in particular. This extreme solidity, which time only serves to augment, ultimately terminates in their becoming useless.

Emplastic unguents do not contain any metallic oxides, and therefore the fatty substances which enter into their composition acidify and are decomposed more speedily. Those which contain essential oils dry and harden, owing to the evaporation of these volatile substances. In order to preserve emplastic unguents they are rolled into cylinders. Thus made up into masses they offer but an unextensive surface to the air, and keep the longer.

We are compelled, owing to the solidity of plasters and emplastic unguents at ordinary temperatures, to soften them by heat, in order to use them. Some are melted, run upon linen, and are called *Sparadraps;* others are dipped in water more or less warm, and then spread out with the moistened fingers upon leather, linen or tow, for application.

Emplastic ointments possess very dissimilar virtues; some are even emollient, as for instance the spermaceti ointment; but such is not the case with plasters. Almost every one of this class of remedies irritates the parts upon which it is applied. This property is possessed not only by metallic oxides when combined with burnt fatty substances and resins, but by the latter substances themselves. Their close adhesion to the surface of the skin prevents any outward evaporation of cutaneous perspiration; the skin, softened by the sweat which collects in drops beneath the plaster, becomes more pervious and sensible to the action of irritating medicaments. This effect, which is observable even in using the very mildest emplastic unguents, such as the gummed diachylon, is more particularly perceptible from those plasters which are compounded with oxides; in young persons, with very delicate skin, it often goes so far as to produce an erysipelatous inflammation of that tissue, and that even when the compound does not contain an ingredient capable of producing either rubefaction or vesication, if it were to be exhibited under another form.

There are plasters, however, which independently of this property of greater or less stimulation common to all when their con-

tact is prolonged, are astringent, vesicatory, and even narcotic. We are about to offer recipes for the composition of such as are most employed.

The Solid Spermaceti Ointment or Plaster.

R. Ceræ Albæ, ʒiv. Spermaceti, ʒij. Ol. Sem. frigid. quatuor. ʒss. M.

Melt it at a moderate temperature, mingle the ingredients carefully, and make it up into rolls.

When spread upon fissures, chaps, warts, and corns upon the feet, it relaxes the skin and softens the epidermis.

Plaster of Andrew De La Croix.—(Pharmacopœia.)

R. Picis, Alb. ʒij. Resin. Elemi, ʒiv. Tereb. Pur. Ol. Lauri Nob. aa. ʒij. M.

Gum Resin Plaster, called the Gummed Diachylon.

Melt the following articles at first, upon a slow fire, viz.—

R. Emplast. Simp. ℔ij. Ceræ Flav. Picis Albæ ; Terebinthinæ, aa. ʒij. M. Add to these Gum. Ammon, Gum. Bdellii, Gum. Galbani, Gum. Sagapeni, aa. ʒj. M. Dissolve these in a sufficient quantity of diluted alcohol; evaporate to the consistence of honey; add the mixture to the melted plaster, and incorporate the whole with great care.

In order to spread this plaster upon linen, it is modified in the following way :

R. Emplast. Simpl. Emp. Diachylon. gummat. aa. 15 parts. Ceræ flav. 5 parts. Terebinthinæ, 3 parts. Melt them in a water-bath, and spread them upon plaster-cloth.

These two plasters, and the diachylon in particular, are frequently used under the form of sparadraps for making the adhesive strips which reunite wounds and ulcers, and to be applied in large pieces upon parts which threaten to excoriate from pressure. It has not been our intention, in detailing the composition of the diachylon, nor indeed in any formulæ which we have given, to put the surgeon in the way of preparing for himself the medicines of which he makes use, but merely to inform him of what and how they are made. Besides which, as the usefulness of adhesive plasters does not allow of our substituting anything else for them, all persons who practice surgery far from towns in which apothecaries reside, ought always to have by them a roll of gummed diachylon, which it is only requisite to spread upon linen in the way which will be described when speaking of adhesive sparadraps.

Blistering Plaster.

R. Picis Alb. ʒvij. Ceræ Flav. ʒvss. Tereb. ʒiiss. Pulv. Cantharid. ʒiv.

Melt the first three substances together; strain through fine linen;

stir them for some time, take the mixture from off the fire and add the cantharides by intimate incorporation. When cold, make it into rolls.

To use this it must be softened by heat, and spread with wet fingers upon a piece of leather or linen. To add to its energy, the surface is covered with a little of the powder of cantharides steeped in strong acetic acid, and is sprinkled with powder of camphor to lessen its action upon the urinary organs.

If neither this plaster, nor that called English blister plaster is at hand, we may, on an emergency, establish a blister with a solid cerate, in which, when fluid, an equal weight of the cantharides powder has been dissolved.

Resolvent Plaster.

R. Emp. Saponis, Emp. Cicutæ, Emp. Gummat. Diachylon. Emp. de Vigo. Mercurial. aa. p. e. M.

This formula was once much used as a deobstruent and maturative plaster, that is to say, to promote suppuration or produce stimulation in chronic scrofulous tumours, and long standing congestions, the resolution of which it is desired to effect.

SPARADRAPS AND ADHESIVE PLASTERS.

The term *Sparadrap* is applied to pieces of linen, flax or hemp, silk, or leather, spread with a plaster capable of adhering to the skin. Some sparadraps are made by the plaster being poured upon paper; but we would recommend their not being used, as they are not at all to be depended on from their want of solidity. A well made sparadrap is limber and flexible; the coating of the plaster is thin, smooth, and fusible enough to soften by the heat of the skin; it ought also to adhere evenly to it, and to come off entirely without leaving it dirty by the remaining of some portions behind.

Adhesive plasters or agglutinatives are more particularly employed in the sparadrap form; and are used in large pieces or sheets, plasters properly so called, cut into strips for application.

The material selected for making the plaster is most usually gummed diachylon. That of Andrew de la Croix, and the caoutchouc of Swediaur, as it is called, are likewise adapted to the same purpose.

Agglutinative Sparadraps are to be found ready prepared at the apothecary shops, put up in rolls, eight or nine inches wide and three or four feet long. They are prepared by means of an instru-

ment, consisting of a rule placed lengthwise between two uprights which are fastened by their feet into an horizontal slab. This rule, which is received on either side into a groove chiselled out in each upright, is movable and fastened by screws, so that the space contained between the rule and slab may be increased or diminished at pleasure. This space or separation, which acts as a drawing plate, ought only to admit the thickness of the cloth on which it is to be spread, and that of the layer of plaster itself. The cloth is passed in beneath the rule from behind; the melted plaster is poured on behind the rule, and by drawing towards oneself the ends of the cloth, its whole length is brought out successively spread with an uniformly thick stratum of the adhesive compound.

As neither this machine, nor a linen roll ready made is always at command, and yet adhesive plaster is incessantly wanted, it is enough to have a roll of the plaster itself at hand, care being taken not to let it be too old, which makes it brittle and impairs its tenacity. It is melted, and poured upon a piece of linen which is carefully stretched upon a smooth table by each of its four angles; a rule held edgewise is then used for propelling the liquid forwards quickly over the linen, so as to spread an even layer over every part. In every case, select thin, light, and downy linen for the purpose: and therefore that which is somewhat worn is the best.

A plaster thus spread soon becomes solid on cooling. To use it, each part should be quickly held before a hot fire; it then melts, and if hastily laid on the skin, adheres tenaciously to it. Care must be taken, in this manipulation, not to expose the plaster to so long a contact with the heat as will cause the liquid to be absorbed by the cloth, for in that condition, its adhesion is but imperfect.*

In order to make English *court plaster*, improperly called gummed silk, one part of choice isinglass is cut into little bits, and digested in four parts of water, in an earthenware vessel placed upon a sand bath. When this is dissolved, it is strained through a fine linen; eight parts of weak alcohol are added, it is again evaporated to one half, and strained again. The tepid liquid is then spread upon black silk with a camel's hair brush. Four or five layers are put on in this way; but before a fresh one is applied, care must be taken to see that the former is perfectly dry. Between the last two

* The best adhesive plaster to be procured in this, or perhaps in any country, is that manufactured by Mr. Samuel P. Griffiths, an apothecary in Philadelphia, Penn.—*Trans.*

coats of the icthyocolla, a little Tinct. Benzoin. or Balsam Peruv. is spread on to give it an agreeable flavour. Thus prepared, the plaster is allowed to dry for twenty four hours before it can be used.—(*Pharmacopœia.*)

This perhaps would be a proper place for the introduction of some observations upon escharotic substances, being as they are, local or topical medicaments; but as they are nearly allied in their properties, and all those which have preceded them have differed but in the form of application, we refer to the article on cutaneous irritation and artificial ulceration for whatever concerns them, in which we shall also speak of vesication and cauterization, which result from their employment.

OF BANDAGES.

The word *bandage* expresses that arrangement which is effected upon a limb or diseased part, by the methodical application of compresses, bands, and the other pieces of linen which make up a dressing. The name is given also, even when they are not employed, to the different linens, &c., used in a particular way to constitute an apparel, as for the support of fractures; and thirdly, it is extended to include mechanical agents, such as suspenders and field tourniquets.

Of these different bandages, some are simple and fulfil indications which are more or less common to all dressings, whilst others are complex, and chiefly intended for special purposes.

The application of bandages is in general the last step in, and as it were the finishing stroke to the performance of dressings. Sometimes it is itself the dressing; for instance, when there is no wound, and it is only necessary to preserve articular surfaces in contact after the reduction of a dislocation, the whole dressing consists merely in putting on a bandage.

We have already shown that bandages are known by various names relating to the offices which they perform. The *preservative* bandage protects the parts to which it is applied, defends them from the contact of external things and from sudden changes of weather. The *uniting* bandage keeps in apposition divided parts; the *dividing* bandage impedes the re-approximation of such parts as it is proper to keep asunder. The object of an *expelling* bandage is to aid in the evacuation of fluids; the *compressing* bandage is either placed upon vessels to arrest hæmorrhage, or upon a tumour to check its disposition to immoderate growth, or to atrophise it by pressure. A *retaining* bandage opposes a fresh exit of reduced parts, as of herniæ; the *suspensory* either supports organs situated outwardly upon the surface of the body, such as the mam-

mæ in females and the testes in males, or else projecting tumours which are distressing by their great weight. Lastly, of all bandages the *containing* one is most employed, and is adapted to the largest number of cases; its office is to retain the various portions of dressings, to keep on topical remedies, to prevent a reduced luxation from slipping out of place, and it is a principal indication in the treatment of fractures by opposing the muscular contraction which would cause the fragments of bone to overlap. A last use of bandages is to straighten curved bones; and the apparatus for this purpose has not received a particular name, having reference to the object for which it is especially intended.

All bandages, be they what they may, belong to either one or the other of at least two of the technical denominations above enumerated; the same bandage more frequently answering several ends at the same time, and being at once preservative as it regards external objects, expellent to liquids concealed deep in abscesses, compressing and uniting as it regards approximation of sides, and contentive as it keeps the whole apparatus together: in a word, not only has a bandage always several uses, but it may be said that the more objects it effects, the better is its construction.

The space which is at our command forbids us to enlarge much upon the variety of bandages; we shall therefore speak of them in reference chiefly to their surgical indications, as above detailed; of these we have already, in the article on dressings, spoken of bands and compresses, of the compressing, expellent and dividing bandages, and of suspensories. The uniting bandage, as its application will be more easily conceived after an account of the diseases for which it is used, we refer to the chapter on wounds; and shall treat anew of the compressing bandage in its adaptation to the cure of hæmorrhage. It remains for us to discuss such only as can be nowhere else introduced with propriety in the course of the work.

However, as it is important to become familiar with the form and disposition of bandages in order to acquire dexterity in using them, we shall copy from M. Gerdy's excellent treatise his classification of bandages, giving an example of each kind, and referring for more minute details to the original work itself.

It would be useless to dwell upon the preserving bandage, whose sole object is to assist in the maintenance of counter-irritants, and as moreover, we shall have occasion to speak of it when treating of the latter.

THE EXPELLING BANDAGE.

It is employed in the treatment of phlegmon, of phlegmonous erysipelas, compound fractures, &c.; in a word, wheresoever there exist purulent abscesses of much depth which require to be emptied, whilst at the same time we prevent fresh collections from forming. For this purpose, the bandage of Scultetus which will be directly described, and a rolled bandage whenever it can be applied, are the best means. To aid in evacuating pus, and to assist in the pressure effected by the bandage, we have recourse, as was said in speaking of dressings, to tampons and graduated compresses, the greatest thickness in which corresponds with the depth of the abscess or fistulous passage.

THE COMPRESSING BANDAGE.

The best bandages for exercising pressure are the rolled bandage, that of Scultetus, and the eighteen tail bandage. Having already detailed the uses of compression, we shall not return to the subject. The roller bandage will be mentioned further on.

Bandage of Scultetus, or that of separate strips.

This is of frequent employment in many diseases of the limbs, and of the lower especially; and consists of many separate bands, each two inches and a half wide, and so long as to surround one and a half times that part of the limb to which they are applied. From this it follows, that the bands for the lower limbs for instance, must be of unequal length; those which go around the lower part of the leg will be the shortest, whilst each strip further up will grow longer and longer up to the upper part of the thigh. The strips are laid transversely upon a napkin, or splint-cloth for fractures; that which goes on the upper part of the thigh is laid down first, the second strip is to be placed upon it in such a way as to cover its lower third, or half of its width; and then each successive strip will in like manner cover from above downwards that which precedes it, until we come to the last, which remains free. The row of strips forms a long square, whose width, greater above than below, depends on the length of the strips; and its length, made up of a succession of similar strips, is of course proportionate to that of the limb which it is to cover.

To apply this bandage, we spread out the napkin which contains it upon one or two pillows, and slip the whole under the diseased limb, which is suitably supported by assistants.

When nothing more is required than to make compression, the bandage is put directly upon the limb; but in fractures, ulcers, wounds and large phlegmons, in addition to appropriate dressings, we are wont to lay previously upon it compresses steeped in different emollient, narcotic or resolvent solutions, to suit the indication and exigency of the moment. In every case the compress ought to be accurately fastened down upon the integuments, without making creases, the pressure of which would inflame the skin beneath. To aid in doing this, it is customary, after having moistened the compresses, to stretch them strongly by the four angles, being assisted by an aid. The application of the bandage begins with the lowest strip. It is proper that the bandage should be moistened in the same way as the compresses, which is done by passing a wet sponge or cloth over each piece. The surgeon, who stands on the outer side of the limb, then takes hold of one end of the strip, which is held tense at the other by an assistant, and applies it perfectly flat, crossing the axis of the limb obliquely. When he has reached the opposite side, the free tail will very often, by being too long for the size of the part, form irregular wrinkles underneath, which upon pressure from the superincumbent limb would be very painful; if so, we pull upon the free end of the tail with our left hand, and depress the pillow or mattress, so as to allow the fingers of the right hand to pass the band underneath the limb, after which the end folded under is raised laterally. Then taking the second tail of the bandage from the hands of the assistant, we apply it in the same way, by crossing the first tail obliquely; then we successively lay down the other strips, the second covering the first for one third or one half of its width, the third covering the second, and so on, up to the top of the limb, always going from below upwards, or in an opposite direction to the formation of the apparatus.

The bandage, as now described, answers for establishing pressure. In order to convert it into a dressing for a fracture, by which the limb is to be held solidly together, so as to control the force of muscular contraction, it is perfected by the application of chaff pads, upon which are laid the splints enveloped in the splint-cloth, or not, according to the seat of application, and the whole is strongly bound together by tapes or ribands knotted upon the splints.

Scultetus' bandage is convenient in practice. The ease with which it can be entirely applied, without inflicting injury upon the limb, makes it, so far, preferable to the rolled bandage. Besides which,

if one, or several strips have been soiled by pus, blood, or foreign liquids, it is easy to change them, one or all, without being obliged to apply an entirely new apparatus; we sew to the end of the one strip another similar in size, and as one is pulled out from under the limb, the other slips into its place. Advantages so great as these render its use extremely valuable in cases of fractures complicated with wounds, of inflammation attended with severe pain, &c., in which it is necessary to keep the limb as still as possible, and at the same time frequently to renew the dressings. Cases of œdema, varices, large cicatrices, and ulcers on the legs, are the only ones requiring strong pressure to be long kept up, and in which motions of the limbs are unattended with danger, wherein the rolled bandage is preferable to the one now described.

The eighteen tailed bandage is very analogous in form to that of Scultetus, and as, without increase of solidity, it has the inconvenience attached to it of requiring the whole to be changed when only a part is soiled, we shall not enter into any special description of it. Neither do we think it necessary to describe separately the retaining bandage; whose action is only exerted for the retention of reduced herniæ and dislocations. It comes properly under the more general head of containing bandages.

THE CONTENTIVE BANDAGE.

This general title is in reality so vast, as in fact to comprehend all bandages whatsoever; no application of dressings upon a diseased part being separable from the contentive action. The special name of contentive or containing bandage has been set apart for that apparatus whose principal object it is to *contain*. Accordingly, we have containing bandages for wounds, drains, dislocations, and fractures. But here again the want of precision in technical distinctions is apparent; the two former of these contentive bandages are likewise preservative; that of wounds is almost always uniting also; the third is similar to the retaining, and the fourth is equally a compressing bandage. As it respects the arrangement of this species of apparatus, it must evidently be infinitely various, according to the size and form of the different parts, the extent and location of the affections for which we apply them, and the end for which they are directed. The following section will afford us examples of several particularly intended for certain parts; but it deserves to be remarked, in passing, that it will depend on the inge-

nuity of the surgeon to effect the various changes which particular cases will require.

With regard to form, bandages are divided by M. Gerdy into simple and compound; under which are arranged the forms or genera following. Among simple bandages are, the *circular*, the *oblique*, the *spiral*, the *crossed*, the *knotted*, the *recurrent* or *hood*, *ligatures*, and the *full bandage*. Among the compound are reckoned, the *T* bandage, the *cross-shaped*, *sling*, *suspensory*, *sheath*, *laced*, and *buckled* bandages.

OF THE CIRCULAR BANDAGE.*

This is made of a linen band, the turns of which go horizontally around the parts, covering one another more or less completely. Usually they preserve in place and *contain* dressings or topical applications; they require but moderate tightness, lest they might impede the return of venous blood, or the functions of different parts. The following are the parts to which they are applied:— To the head, the turns surrounding it from the forehead to the nape of the neck. To the neck, where they make a kind of cravat. To the chest and abdomen, either a wide bandage, or a napkin folded in three being used, the centre covering the back behind, and the ends being brought round in front and fastened with pins. This constitutes the *body* bandage used in all cases of fracture of the ribs, to oppose the displacement of the broken ends; in wounds of the trunk, in rheumatism, and after tapping; in certain cases of pregnancy, in which the female is distressed by the weight of the uterus; as a place for fastening the strings which go off from a catheter or pessary, &c. Lastly, the circular bandage, as a preservative and contentive means, is often applied to the arm, forearm, fingers, thigh, leg, and toes, in cases of erysipelas, burns, or phlegmon, or when drains, wounds, or ulcers require protection.

OF THE OBLIQUE BANDAGE.

It is formed by several turns of the band, which describe circular layers obliquely directed from one side of the neck under the axilla of the other side, alternately passing before and behind the upper part of the thorax. Its use is to keep dressings within the

* For the method of making and rolling bandages, the reader is referred to the previous chapter on bands.—*Trans.*

hollow of the armpit; but it requires daily re-application, as by the coming of the arm against the chest, the circular turns soon become twisted into a rope.

OF THE ROLLED OR SPIRAL BANDAGE.

This species, which is effected by a single or double headed roller is, as we have seen, chiefly a means of compression, and used in every case wherein that is necessary. Having sufficiently described the mode of its application in our chapter on dressings, we shall not here repeat it. The only change required to go up and down with a double-headed roller, is to lean the tails obliquely in that direction in which we are to advance, always being careful to make a reversed fold, the back of which must look up or down, according to the increase or diminution in size of the part over which the bandage passes, in order to avoid wrinkles at each point of intersection. Spiral circumvolutions (*doloires*) vary according to the quantity of space on which they overlay each other; they may just touch, or there may be a separation between the turns. To preserve these distinctions, and render their denominations significant, M. Gerdy has proposed to call the spiral turn bandage, *semi covered spiral;* that in which the turns overlay, the *contiguous spiral;* and that in which they do not touch, the *separated spiral.*

Besides its use as a compressing and retaining means, the spiral bandage is also useful in reuniting longitudinal wounds; when we treat of the latter, we shall return to it, whilst alluding to uniting bandages.

A spiral bandage may be applied to the trunk; but is more uncomfortable and not so firm as the body bandage. It does better on the upper and lower limbs. These may be wholly or partially covered by it; but the extremities of the limbs can alone be isolatedly supported by it, for care must always be taken, as was said in speaking of compression, in order to avoid unpleasant stases of fluids, never to surround that part of a limb which is nearest the trunk, until that which is farthest from the heart has first been compressed by the bandage.

THE CROSSED OR FIGURE 8 BANDAGE.

This is made of two loops, the ends crossing one another in such a way as to describe the figure of the numeral eight. A single or double headed roller bandage is used for the purpose.

It is applied upon various parts, and with various intentions.

Over the eyes, it is made simply with one band, which describes horizontal circular turns from the forehead to the occiput, passing above either ear, and others obliquely circular, which go up from the forehead to the parietal protuberance of the sound side, go down behind to below the ear on the diseased side, come up again on the forehead passing over the affected eye, and so on. When both eyes are attacked, we make use of a single or double band, and describe alternately two series of oblique circular turns, such as we have described, which will cross one another on the forehead like the letter X. The bandage is used to protect the inflamed eyes from the light, or after the operation for cataract, having previously covered them with a thin and soft compress.

The solidity of this apparatus is its chief advantage; but this is more than counter-balanced by the length of its application, the difficulty, if not the impossibility of bathing the eyes when necessary, and its overheating the head and the eyes themselves. It is much better only to employ two compresses put over the eyes, and held on the forehead by a few loose circular horizontal turns of a bandage, and to confine the patient to a dark room.

The crossed bandage has different names, according to the parts upon which it is applied. When placed upon the lower jaw to support a fracture of the neck or body of this bone, it is called the *halter* bandage (*chevestre*). This *halter* is single or double, according as it is made to describe one or two series of oblique turns; and a single or double headed roller is used in applying it. In the first case, the initial end of the roller is placed on the nape of the neck, and fastened by two horizontal circular turns directed from right to left when the injury is on the left side, and *vice versa*. When the band has come again to the nucha, we pass under the ear, on the sound side, and under the jaw, in front of the ear of the diseased side; get obliquely to the vertex, go down again behind the ear on the well side, beneath it and the jaw; ascend over the fracture, and so on, describing circular turns directed obliquely as it regards the vertical line, and finish the operation by new horizontal circular turns. The bandage, thus applied, ought to press upon the ramus of the jaw on the side where the fracture is, and form two points of intersection, one on the temple of the diseased side, the other upon the mastoid region of the well side. For the double *halter*, after applying the centre which is intermediate between the

two heads of the bandage upon the forehead, and crossing those heads on the nucha, they are brought under the chin, then are made to ascend vertically in front of each ear to the upper part of the forehead, and thence go to the nape of the neck again. At each of these points, the globes are again intercrossed by reversed folds. Several of these circumvolutions are in this way described, which finish the bandage when the fracture is vertical; but in case of the fracture being oblique, when the fragments have always a great tendency towards displacement, after the first turns under the chin, the tails on leaving the nucha are intercrossed in front of the chin, brought back to the nucha, then upon the forehead, and finished by a few circular turns. For greater solidity, the intercrossing upon the chin is sometimes doubled. The bandage efficiently resists all motion of the jaw; it is customary, before applying it, to place between the molar teeth flat pieces of cork cut laterally, following the natural curve of the dental arch; there is thus a separation effected between the incisors, which allows of our introducing soft or fluid aliment into the mouth.

The figure 8 bandage, when adapted to the armpit or groin, is called *spica*. In every case, from the circumstance that the roping of the turns of the bandage beneath the fold of the axilla or thigh painfully compresses the tender skin of these parts, it is proper, before applying the bandage, to protect the integuments by dry compresses, or what is still better, compresses spread with cerate; an observation which of course applies only to those of articular folds where no dressings are adapted, as, in the latter case, the apparatus would prevent any immediate friction.

The figure 8 bandage to the axilla is put on in two ways; in the first, called the oblique spica of the neck and armpit, one ring includes the lower part of the neck on the one side, and of the axilla on the opposite side; its turns cross each other upon the shoulder passing from the anterior part of the neck to the posterior surface of the shoulder, and *vice versa;* in the second way, called the modified spica, two rings are also formed, one obliquely embracing the chest, for instance, from below the right axilla over the left shoulder, at which place occurs the intersection; the other, starting from the same point of intersection, and returning to it after having enveloped the left axilla. These bandages are useful chiefly as contentive of dressings made to the lower part of the neck, on the shoulders or in the armpits.

The spica of the groin, owing to the great bulk of the parts which it surrounds, requires a bandage seven or eight yards in length and of four fingers width. To apply it, two circular turns are first taken horizontally around the pelvis, below the cristæ of the ilia, going, as it regards the patient, from right to left and from before backwards. The bandage, if it is to envelop the left groin, having reached the top of the pubis on that side, the centre of the band is successively directed upon the groin, the trochanter major, under the fold of the nates and of the thigh; the band is brought back in front of the groin crossing the first turn, the pelvis is again surrounded by an horizontal turn, then the thigh by an oblique turn, so as to describe an 8, the left groin being the point of intersection. If we apply the spica to both groins, after we have described our first circle around the buttock and thigh of the left side, we pass behind on the loins; then, having got to below the anterior superior spine of the ilium of the right side, we pass obliquely over the groin, under the fold of the thigh and buttock, recross the groin, go once more round the pelvis and return to surround the left thigh, and so on, always taking one turn round the pelvis between those which alternately envelop either thigh; so that the rings form a double 8 around the trunk and either thigh, the two groins in which, forming the points of intersection, suffer compression. The band necessary for executing this bandage should be eight or twelve yards long, according to the plumpness of the patient. It might evidently be done easily by a double headed roller.

The spica bandage, whether single or double, is contentive of dressings applied over the groins in inflammation and injury of those parts; as a means of compression, it is used after operations for inguinal hernia, to guard against a re-escape of the intestine. At the time of being applied it answers well, but as its fulcrum is not above the cristæ iliacæ, it is liable after a certain time to slip and become loose.

There are yet many crossed bandages which, owing to the ends they answer, are of frequent use in surgery; but our remaining space and intended object do not admit of our describing them. We will mention, particularly, that of the chest and arm, made by horizontal circular turns around the arm and chest, and by oblique circular ones, which pass from under the elbow of the diseased side upon the shoulder opposite. The same bandage may be employed for making the two sorts of circular turns, but two bandages, one

for each, are more convenient. It is serviceable for keeping in apposition a reduced fracture of the clavicle or acromion; the arm, before its application, must be raised up, and the outer end of the clavicle drawn outwards; in this position they are kept by a pad of a conical shape stuffed with chaff, the larger end of which fills up the axilla; the cushion has tapes on each side, which tie upon the lower part of the neck on the side opposite.

Lastly, crossed bandages are used over one or both shoulders for suspending the mammæ and the dressings to those organs. The figure of eight bandage is also applied to the elbow, after venæsection; around the knee, foot, or hand, to sustain dressings; over both knees, to confine the femur after having reduced a dislocation of that bone; to the instep, after bleeding in the vena saphena, whence it has contracted the special name of *stirrup*.

THE KNOTTED BANDAGE.

This bandage, called also the packer's knot, is employed only on the head after wounds of, or bleeding in the temporal artery, and will be described under the head of that operation. We shall here merely allude to it.

THE RECURRENT OR CAP BANDAGE.

This is made by circular turns, alternately horizontal and oblique or parabolic, so that the bandage, seen as a whole, forms a kind of hood or cap (*capeline*), whence its name. It is applied over free extremities of a circular form, such as the head, and stumps after amputations. It is indifferent whether a single or double headed roller be used for the purpose; the length of the bandage must be in proportion to the size of the part it is intended to cover, and its width that of three fingers.

In order to put on a recurrent bandage for the head with a single headed roller, we apply the end of the initial tail upon the forehead, and describe, from right to left, two horizontal circular turns passing behind the nucha, so as to fasten it. Returning then to the middle of the forehead, we reverse the centre of the band, from below upwards, and keep down the fold by the finger of an assistant; we then direct it, lying obliquely above the left ear, to the nape of the neck. Here another reversed fold is to be made, which also must be kept down firmly by the finger of the same assistant's other hand, and then we return towards the fore-

head, describing an oblique semicircular turn like the former, which it ought to cover in one half of its width. Coming again to the forehead, we make another reversed fold, and so proceed, until nothing remains to be covered but the top of the head. When one half of the head has been enveloped, instead of applying the median semicircular turn, we direct the tail of the band obliquely to the right, to describe the second half of the bandage, going down from the vertex towards the ear, so that only the median line remains to be covered. By a reversed fold and a semicircular horizontal turn, we regain either the forehead or the nucha; we then reverse the last circular turn which is applied on the top of the head, and complete the covering by overlaying the last two nearest turns. All that is now necessary, for finishing the operation, is to keep down, by a few horizontal circular turns, the folds of the bandage, which, hitherto, had been pressed upon by the fingers of the assistant.

The cap or hood bandage put on in this way, is done much more easily and quickly than if a double-headed band had been used; but its adaptation is less even and possesses less solidity. Nevertheless, it lasts very well for twenty-four hours. If it is required to be worn for a longer time than this, a few pins, by fastening the horizontal circular to the oblique turns, would connect the apparatus very well in one single system.

In forming the recurrent bandage with a double-headed roller, one head must always be made to describe the semicircular horizontal turns, and the other head the semicircular oblique ones. For instance: laying the intermediary centre upon the forehead, you direct the two globes above the ears as far as the nucha; the head of the roller which is to describe the horizontal circular turns, which we shall call A, will pass behind the head B, which is intended for forming the oblique semicircular turns. The centre of the latter will be reversed from below upwards, beneath the lower edge of the former, and brought obliquely to the forehead; when there, it is in like manner slipped beneath the centre of the head A, and again reversed upon it to return to the nucha by the opposite side. By going on in this way, it is evident that the head A will always describe horizontal semicircular turns, whilst B will describe oblique semicircular ones, alternately to the left and to the right, until by a succession of turns, which always keep ascending, the whole head shall have been covered. The bandage is ended by

exhausting the rolls with semicircular turns. The objections to this latter bandage are its length and the difficulty of its smooth application, the compression and overheating the head of the patient. In this respect, the single head roller cap is preferable, as the ease with which it can be secured with pins does away with the necessity for tightening the turns so much.

The cap-bandage, applied to the head, serves to sustain dressings of every kind; but it is manifest that in the greater number of cases, a few horizontal turns of a band, crossed at right angles by other vertical turns from the vertex, and brought under the chin, will fulfil the same purposes, with quite as much, or even more solidity as it regards the apparatus, and a great deal less inconvenience to the patient.

It is in the dressing of stumps that the cap-bandage is really far preferable to any other kind. A single headed roller is used for the purpose. Having applied our elongated compresses, we take a few turns circularly round the top of the stump, to secure them; then we encircle its free extremity by oblique circular turns, the last of which covers the centre; the reversed folds on either side of the stump are kept down by circular turns perpendicular to the axis of the limb, which will exhaust the bandage. In fact, the process is precisely that which we have described at greater length in its application to the head.

ENTIRE BANDAGES.

Beneath this title M. Gerdy has arranged such as are formed of whole and undivided pieces. The chief are, first, the triangular for the head, which consists merely of a piece of linen folded in a triangle which covers that part; and which is in fact the way that handkerchiefs are daily worn upon the head by the lower classes; secondly, the large head-kerchief, made of a large quadrilateral piece of linen, &c. We think it useless to describe this bandage; which, though solid indeed, is long and tedious in its application, besides being uncomfortable to the patient and overheating the head. As respects these objections, the sling bandage to be hereafter described, is far preferable.

A handkerchief or any four cornered piece of linen, folded on itself into a triangular form, is often used under the name of *scarf*, or *sling;* it is of use in diseases of the hand and forearm, to support their weight, the forearm being bent upon the arm. This, in point of

fact, is a suspensory, and its application is independent of any other bandage for wounds or fractures. To make a sling is very easy; the diagonal or largest side of the triangle is turned towards the affected limb, and the two acute angles are tied in a knot on the lower part of the neck on the opposite side. We have in this way, on a level with the elbow, a loop which is crosswise to the axis of the body, made by the doubling of the two halves of the triangle. The arm and forearm are introduced within it, and are supported horizontally. Its solidity may be increased by fastening the end of the free edge which goes beyond the elbow, to the sleeve of the patient by pins. The right angle which goes beyond the hand is attached in like manner to his dress, when that part is required to be kept warm.

The remarks upon uniting bandages might here be introduced with propriety; but it is our intention to withhold them until we speak of wounds. We shall now commence the consideration of *compound* bandages, or those which are made of pieces separated at one end, and joined to a common centre at the other, by suture or a continuity of tissue.

T BANDAGES.

This name has been given them from their shape. They consist of a piece of linen or a transversal band of width and length proportionate to the size of parts, and upon which is sewn the end of another piece, which intersects the former at a right angle. When there depend two of these vertical bandages from the horizontal one, the whole is called the *double* T bandage.

This is a bandage of a very simple kind: the transverse piece is the principal, and the other serves only to prevent it from being displaced. When applied to the head, the transverse band describes one or several horizontal circular turns from the forehead to the nucha, and the vertical band stretches from one point to the other, passing over the top of the head. It is fastened on the transverse band either by stitches or merely a pin at either end. It serves to keep any dressing whatever upon the head; and if these dressings should be of much size, we are obliged to place two or three vertical bands more or less obliquely upon it; which will give the T bandage the form of a part of the cap bandage.

Simple or double T bandages serve as contentives of dressings upon the nose, eyes, and ears. As nothing is more simple than

their application after we once know their general structure, we shall not describe them.

The body bandage by which the chest is surrounded, and which is kept from slipping down by shoulder straps, is also a double T, and so likewise is that which surrounds the belly, and is held down by thigh pieces.

The double T bandage, when applied to the pelvis, sustains all kind of apparatus upon the anus, perinæum, inner part of the thighs in either sex, and the vulva in females. The transversal band ought to go twice or thrice horizontally around the body; the two vertical tails should be sewn or pinned behind, at a distance of five or six inches apart; they are made to cross under the perinæum, and are brought up in front and fastened to the transverse band opposite the groins.

The inguinal or T bandage of the groin consists of a triangular piece of linen, two sides of which form a right angle. One of the small sides of the triangle is sewn upon a band in its whole extent, which band is to cover the pelvis transversely; the remaining lower angle is loose and pendant; to it another band a foot and a half long is sewed.

To apply this bandage, the transverse band must be turned upwards, and the large free side of the triangle outwards. The transverse band is put around the pelvis, passing below the iliac cristæ, and the tails fastened behind with a pin, or by tying them; then by passing the band which is attached to the loose angle of the triangle underneath the flexure of the thigh, it is brought up under the buttock, and fastened outwardly and above upon the transverse band. It follows upon a survey of this arrangement, that the small loose side of the triangular piece of linen is inward, and the larger side outwardly, whilst the surface contained between the three sides of the triangle entirely covers the groin. The bandage is useful in retaining all dressings on the inguinal region, during the existence of a bubo, and after the operations for crural and inguinal herniæ. When, however, the patient is very restless, or compression becomes necessary, the spica for the groin is better than the T bandage. Another use of either the simple or double T bandage is to the hand or foot in wounds, burns and other inflammatory affections of these parts; it consists of a band which perpendicularly encircles the wrist. The strip goes from the dorsal to the palmar surface, passing between the thumb and index finger; if two

strips are used, the second slips between the ring and little finger; the ends of each being brought up to the transverse band around the wrist, and either fastened to it by pins, or held down by two or three circular turns. The bandage is sometimes constructed with a piece of linen, which, as it may be required, covers either the dorsal or palmar surface; it is pierced at its extremity with holes, into which the fingers are passed, and are thus parted by small tongues or slips of linen. The end of this compress is in like manner brought up to the wrist, and fastened to a transverse band. It may be made to cover both surfaces at once; in which case, the holes for the fingers are in the middle, and both ends are attached to the wrist-band. Similar alterations in the T bandage are applicable to the foot, except that the transversal band will be turned circularly around its metatarsal portion. The perforated T for the hand and foot possesses the twofold advantage of great lightness joined to much firmness of application. The tongues which intervene between the fingers, powerfully oppose their anomalous adhesion in cases of inflammation or ulceration in the digital folds, such as burns for instance.

CROSS SHAPED BANDAGES.

These are applied to the head, and to the trunk of the body. When put on the head, they are effected with two bandages sewn together in the shape of a cross by the middle of their length; the point of intersection is applied on one temple, so that one of the two bands has a vertical direction, while that of the other is horizontal; one or two circular turns are described in this way by each, so as to make vertical and horizontal circumvolutions; we fasten the end of each with a pin, and by a few stitches or pins, keep the point of intersection firm upon the temple opposite to that on which the bandage was first applied. Two loose bands applied one after the other at right angles, the two places of intersection in each being fastened in the same way, would equally answer the object, and be easier of application. This bandage is used for supporting dressings to wounds of the head. When these are of much size, it is advisable to separate the circular turns a little to secure a larger surface.

Cross shaped bandages to the trunk are nothing less than body bandages supported superiorly and inferiorly by strips, which, under the appellation of *scapularies* or shoulder-straps, and thigh-pieces, fasten the two edges of the bandage, and prevent it from slipping up or down.

SLING BANDAGES.

They are made with a compress or piece of linen, of much greater length than width; this is slit longitudinally, in thirds or halves, at either end to within two inches of the centre, so as to have a middle space intermediate between six or four terminal strips at each extremity. The centre space is applied upon the part; the strips at the ends encircle it, and are knotted on the opposite side.

Six tails or strips are generally made in a sling bandage for the head. After we have applied our dressings, we take the bandage by its centre in both hands, supporting its lower or inner surface upon our fingers, with our thumbs pressing upon its upper or outer surface; we apply it flatwise so that its median part may lie upon the vertex. The three terminal strips will thus be hanging down upon each side of the face. Taking hold of each centre strip, we apply them laterally to the temples, ears, under the chin, and there cross them; each end we bring up on the opposite side of the lower jaw, and, according as the length permits, fasten them there or on the temples. If the ears are rendered uncomfortable by the pressure, they must be passed into slits shaped like button holes made longitudinally in the centre of each tail. Then taking the two anterior strips, we cross them horizontally upon the forehead, bring them to the occiput, and there fasten them. Lastly, the hindermost strips are similarly crossed at the occiput, and brought horizontally forward on the forehead; in either case the two tails are fastened with pins. This bandage thus applied, owing to its security and lightness, is preferable not only to the large head-kerchief, but to the cap bandage itself, both of which are objectionable from overheating the scalp.

When the sling is applied to the chin, four tails are employed, It is useful in retaining a reduced dislocation or fracture which is transverse as it respects the jaw, in place; for an oblique fracture, the double halter merits a preference. The intermediate centre is applied upon the angle of the jaw, so as to inclose it, and the upper tails are directed under the ears, to the nucha, where, by a change of hands, they are crossed and brought up over the ears, and temples, to the forehead, and there fastened with a pin. The lower tails are next taken, and are made to cross the direction of the upper one vertically passing over the rami of the jaw in front of the ear,

over the temples, up to the crown of the head, where they also are, by a similar changing of hands, intercrossed, brought down, following the original track, under the chin, and there fastened.

For burns of great extent upon the face there is a bandage made, called a *mask*, which is very analogous to the sling. It is a piece of linen long and wide enough to cover the whole face. It is pierced with holes opposite the natural openings, the eyes, nose, and mouth, to allow of these parts performing their functions. At the four angles, upper and lower, are attached strings which keep the bandage in place: the upper ones are led to and crossed at the nucha, and are thence brought up and fastened on the forehead: the lower are much shorter, and simply tied behind the neck. The mask supports topical applications upon the face; and its inner surface is often spread with medicinal substances. It is light, but apt to wrinkle up, particularly in the middle; but its application may be rendered more smooth by attaching strings laterally to it, which pass over the ears and are tied behind the head; thereby making a kind of six tailed sling.

The four tailed sling bandage is moreover employed for the bends of joints. Its centre, being applied beneath the axilla, whilst the two lower tails encircle the thorax and are fastened under the opposite armpit, the upper ones being carried to and sustained upon the lower part of the neck, on the sound side, it serves for maintaining topical remedies and dressings within the axillary cavity, being in this case a substitute for the spica or crossed bandage of the axilla. When it is requisite to keep a poultice or dressing of any kind on the fore part of the knee, the centre of the sling is placed under the ham, its ends are brought up obliquely, crossed above and below the knee, and then fastened under the ham again. It is evident, that in the same way the figure of 8 may in very many cases be dispensed with, and the sling substituted for it; for instance, in an affection of the shoulder, the centre resting upon that part, the two lower tails will surround the axilla and arm of the same side, and the upper ones, crossed under the armpit of the sound side, will be brought up and fastened upon the injured shoulder. The hip being diseased, we apply the centre there, encircle the pelvis with the upper tails, cross them on the opposite side, bring them back to and fasten them at the starting point; the lower ones are passed under the thigh of the affected side, crossed, surround the limb, and are tied upon its outer surface. We think it useless to

dwell longer upon this subject, by a description of the mode of adapting the sling to the foot or hand.

SUSPENSORY BANDAGES AND SHEATHS OR STALLS.

The suspensory bandage is used for the nose, the mammæ in females, and the testes in males. We mentioned the advantages to be derived from this species of bandage and the manner of making it, when on the subject of dressings, and shall not now return to the consideration of it.

Sheaths or stalls are yet more simple. The name given them sufficiently explains their shape: which is that of the finger of a glove. They are used as coverings to the penis, fingers and toes; and for supporting topical applications in contact with them. Near to the orifice of the sheath are fastened ribbons which serve to maintain it in place; when applied upon the penis, these strings are tied around the pelvis; when upon the hand, they encircle the wrist, and upon the foot, go round the metatarsus.

TRUSSES AND STRAPS.

These names are given to the bandages which are used for keeping up herniæ after their reduction. They are divided into the elastic and the non-elastic. The non-elastic have also been called soft bandages. They are made from any kind of stuff or tissue, of leather, wool, or cotton. When quite new, they may, at the time of their application, oppose the descent of an intestine to a certain extent, owing to the resistance they make and to their having been put on sufficiently tight; but insomuch as they are inelastic, and consequently incapable of contracting upon themselves, they cannot follow the natural dilatation and contraction of the parts upon which they are placed, induced by respiration and the action of the abdominal muscles. Besides, as they are not long in yielding to the efforts of muscular exertion, they stretch and slacken, and require to be often reapplied, under penalty of a re-descent of the hernia. The tightness requisite for securing them, causes all the most prominent points to become painful, and to tend to excoriation. The application of a cushion, in this case, is equally painful, and Richter details cases of inguinal herniæ in which the testicle and spermatic chord inflamed in consequence of the excessive constriction needed for keeping up the even adaptation of these bandages. Very young children are the only persons on whom we can use them; but

modern authors are of opinion, that even in these cases, it is better to employ the elastic bandage.

The construction of elastic trusses has long exercised the ingenuity of surgeons, at the head of whom may be mentioned Ambrose Paré, Arnaud, and Camper. Arnaud first conceived the idea of employing steel in the formation of the elastic frame of the bandage: Camper, who devoted much time to the subject, has left us some precepts upon the manufacture of trusses, which have caused his name to be attached to the inguinal bandage, most in use at the present day.

Every elastic truss consists, first, of a steel spring; secondly, of a pad or metallic plate; thirdly, of a covering which surrounds the whole; fourthly, of a strap or belt, which fastens the opposite end of the bandage to the plate; fifthly and lastly, in some cases of a shoulder-strap, or thigh-piece, the object of which is to prevent the ascent or descent of the crural or inguinal bandage.

Before we apply a bandage over a hernia, we must be careful to see that the latter has been perfectly reduced, and that there be neither irritation of the intestine, or of the parts through which it had passed. The pad or cushion must always exert its compression in a direction opposite to that taken by the viscera in escaping from the cavity which contains them. Taking an external inguinal hernia as a particular illustration, we perceive the direction of the inguinal canal to be oblique from above downwards, from behind forwards, and from without inwards; now, the viscera pressed upon by the contractions of the diaphragm and abdominal muscles, necessarily tending to escape along a line drawn through the centre of this canal, it is manifest, that to fulfil the above requisite, the opposing pad must crowd back the intestine from below upwards, from before backward, and from within outwards. But in order that this may occur, the end of the spring upon which the pad is fastened must be so twisted, as that that surface which was external upon the hip, shall successively become anterior, then inferior, and slightly internal upon the pad. Owing to this incurvation, the bandage being loose, the pad, fixed upon the spring obliquely from above downwards, from before backwards, and from without inwardly, has a disposition to mount up, outwardly and backwards, towards the hoop of the spring which is to surround the hip; and if we suppose the bandage to be placed *in situ*, and the pad to be applied against the outer and lower orifice of the inguinal ring, it is manifest

that the intestine will be crowded back in a direction perpendicular to the axis of the inguinal canal. The other end of the spring will vary in length according as the pressure created by the pad requires to be greater or less; we have thereupon, what are called *semicircular* bandages, in which the free end of the spring goes not more than an inch beyond the projection formed by the first false apophysis of the sacrum. In the *circular* bandages, on the contrary, the spring encircles the pelvis entirely. In Camper's bandage, it ought to describe ten-twelfths of that bony circle; M. Lafond makes some which are yet more extensive; their point of support is afforded by the projection of the upper part of the *fascial muscle* (*muscle fascia*).

In order that a truss may fulfil every object for which it is applied, it must accurately fit the circumference of the pelvis; it is therefore well to have it made to a measure of that circumference. For that purpose, we make use of either a wire of annealed iron, or what is better, a shred or paring of lead resembling a ribbon, some lines wide and of suitable length, which by reason of its flexibility, is easily applied upon the projections and depressions of the pelvis, the *contour* of which is described in the direction to be passed over by the spring of the truss.

The *spring* is the principal of all the parts which enter into the construction of a hernial truss. We have seen that it is made of a perfectly elastic steel blade, curved upon itself as the middle ribs are, so that when placed upon a flat surface, one end turns down and the other up. It ought to be from two-thirds of a line to a line in thickness; and about eight lines wide. The *écusson* is a metallic plate, usually made of sheet iron, triangular in shape, with the angles rounded off. This plate is rivetted on the lower end of the spring. On its anterior surface are two crotchets or hooks, to which the strap and thigh-piece is fastened, and in a few rare instances, the shoulder-strap; it is covered with *chamois* leather. Upon its posterior surface rests the *pad*. This pad is a kind of cushion made of a sac or covering stuffed within with some soft and slightly elastic substance, such as wool, silk, or cotton; its shape is convex, when applied to retain a hernia the reduction of which is perfect; but on the contrary concave, when part of the viscera not being returnable, it is at once to contain and protect them, and by its accurate fit to prevent any fresh quantity from escaping. The *strap* is, as its name imports, a strip of leather; it is eight lines wide, and five or six inches long. It is strongly sewn at at one end to the loose extremity of the spring, which

is provided for this purpose with several holes for the passage of the thread. The other end of the strap is entirely loose; it is perforated longitudinally in its centre with several holes made by means of a punch. Two layers compose the covering of the truss; one is made of list, or any thing else wound spirally around the spring. For this material oiled silk has been substituted by M. Verdier, which being impervious to moisture, prevents the spring from rusting, which would ultimately produce its fracture. The second envelope is either chamois or morocco leather, which is laid over both spring and pad. In the intermediate space, some wool or a strip of hare-skin with its fur is insinuated, so as to make a sort of cushion, which protects the skin against the pressure of the spring. Lastly, the thigh-piece is nothing but a strip of cloth inclosed in fur; at one end, it has a loop thrown backward around the cushion of the truss; the other end consists of a leather strip pierced with holes like the strap. This thigh-piece is serviceable in thin people, in whom the bending of the thigh has a tendency to cause the pad to ascend into the hollow of the abdomen above the pubis. In fat subjects, on the other hand, the projection of the belly strongly repels the pad, and renders the shoulder-strap needful to prevent its descent.

OF THE APPLICATION OF HERNIARY BANDAGES.

In order to apply a truss, we first lay the patient upon his back, the chest slightly bent upon the abdomen, and the thighs raised on the pelvis, that the abdominal muscles may be entirely relaxed. Having placed the bandage around the pelvis, the surgeon with one hand puts up the hernia, and prevents the escape of the intestines, by placing his thumb and finger over the aperture through which they pass. The other hand takes the place of its fellow, and applies the pad of the truss over the hernial orifice. He then fastens the strap by passing the hook in the scutcheon through one of the holes made for the purpose, and the same is done with the thigh-piece, when it is thought proper to make use of it. That we may ascertain if the bandage now accurately retains the hernia, the patient is made to rise, and to perform various motions of depression and elevation; he is directed to cry out and to cough, and the utmost vigilance is to be used to detect, whether in these various efforts, the viscera tend to slip up by the sides of the pad, or what is more common, below it. When we are fully convinced that every end is answered by the bandage, the patient should on the contrary be

warned not to indulge in violent exertions; and, when these cannot be avoided, as in a paroxysm of coughing, for instance, to press the pad of the bandage with his hand, to prevent its resistance from being overcome by the contraction of the diaphragm and abdominal muscles, and the crowding down of the bowels, which will tend anew to expel them from their natural cavity.

Notwithstanding the utmost care in the application of a truss, even one of the very best construction, it always gives uneasiness for the first few days afterward; it is not uncommon for the pressure to produce swelling of the spermatic vessels and testes, and excoriation upon the skin; but as these occurrences originate chiefly in an extreme sensibility of the parts in certain patients, and as experience proves that he who has at first uttered the most complaint, will afterwards endure the presence of his bandage with the utmost facility, the part should be a little accustomed to its contact by removing the truss at night, and reapplying it only during the day. In the event of inflammation supervening, it must be met by appropriate treatment; nor is the bandage to be again worn before it has entirely subsided.

By the long continued use of these measures, it sometimes happens that we succeed in curing a hernia, and in young persons more particularly. The recovery is, in this case, owing to the adhesions between the peritoneal surfaces forming the covering of the hernial sac. The adjacent cellular tissue also contributes towards it; and a relapse of the disease is so much less probable, as the cellular adhesions to the neighbouring parts are numerous and well organized. In this way it is, that congenital hernia in children, in young persons, and sometimes also in adults, is remedied by pressure. In the latter of these instances, however, it would be hazardous to allow the patient to lay aside his truss prematurely, until he has acquired the certainty of being able to discontinue it with impunity; to do this, laying the hand upon the hernial aperture, he should be made to cough, and perform the various motions mentioned above; and then, if we can discover that the passage of the intestines is prevented by some obstacle which hinders them from clearing the opening whence they had previously issued, we may direct our patient only to use the truss in the day time, afterwards, only when he is called upon to make some unusual exertion, and after the further lapse of a certain time, he may be allowed to dispense with it altogether.

Minute as the precautions we have thus inculcated may appear, prudence has established it as a law, that they are never to be departed from; instances are unhappily too frequent, of persons, who, having refused to obey them, have had strangulated herniæ which have compelled them to take the chances of one of the most critical operations in surgery. The danger from this cause is materially added to, by the fact that the relapse being owing to a species of laceration, the cicatrices which obstructed the escape of the intestines themselves become, after the rupture, new instruments of strangulation.

THE DOUBLE INGUINAL BANDAGE

Differs from that which we have described, in that the plate has adapted to it a prolongation also of sheet iron, of a ribbon form, which, crossing the super-pubic region, sustains a similar scutcheon opposite the abdominal ring of the other side. This plate has a pad and cushion the same as the former, stuffed and covered in like manner. In this kind of two-pad bandage, the spring generally comes upon that of the right side, whilst the hooks which fasten the strap belong to that of the left; if, however, we have an omental hernia on the one side, and an intestinal one upon the other, it is advised, as being preferable, to fasten the spring on the pad which is to keep up the epiplocele, as it is a species of hernia more easily produced than the other.

THE CRURAL BANDAGE.

This is one which is to exert its power upon the crural arch itself. Here again it is clearly essential that the intestine should have been perfectly put up, that the bandage may be applied; for in an inguinal hernia, pressure being made upon the external abdominal ring only, the viscera crowded up are yet within the inguinal canal, since its track is included in the thickness of the parietes of the abdomen; but the space called crural canal, on the contrary, is without the abdomen, and pressure on the intestine it contains, by bearing against the thigh, would create real strangulation. The hernia being reduced upon the principles laid down on the subject of the Taxis, we apply the pad over the crural ring, keep it in place by the strap and thigh-piece, just as was described when speaking of the adaptation of the inguinal bandage.

The difference between these two kinds of trusses lies in this; in

the crural bandage, a circular spring is not necessary, for the force with which the viscera tend to escape outwardly is infinitely less than in inguinal hernia. Accordingly, the spring need only extend backward for an inch and a half beyond the middle depression in the sacrum; it will go down, in front, obliquely, more so downwards, less so inwardly, and its twist must be greater than in the inguinal truss, so that the back surface of the plate may turn more upwards; the latter will be about two inches in its transverse extent, and only an inch or fifteen lines in its vertical height, so as to interfere as little as possible with the flexions of the thigh. Lastly, as the motions of the limb have a tendency to push up the pad, particularly in thin persons, there exists a greater necessity for a thigh-piece in this than in inguinal hernia.

UMBILICAL BANDAGES.

Of these we possess several varieties. The object of some is to keep up umbilical herniæ, or those occurring in the linea alba; these consist of a pad and a belt. Others are belts only, and are intended merely for supporting the weight of the abdominal viscera, in cases of giving way of the linea alba, which occur after pregnancy.

The bandage for umbilical hernia is made in several ways; some kinds are formed of a circular or semicircular spring, kept on, as in all other trusses, by straps fastened to the pad. The instrument accommodates itself but badly to the motions of dilatation and collapse of the belly attendant on respiration; and that of M. Verdier, a belt with spiral springs, deserves a preference over them. This truss consists of an umbilical pad, a belly piece and a belt. The pad for the navel has two surfaces; an outer or anterior one, an inner and posterior one. The latter is in contact with the hernia, and must be soft and well stuffed, that it may not injure the parts. The shape and size of the pad differ, according to the reducibility or irreducibility of the hernia. If the first be the case, its inner surface is convex and should rather exceed the limits of the aperture; in the second case, the surface is concave, so as to receive and protect the tumour, and prevent a new protrusion of intestine. The exterior surface, which looks outwardly, ought to be furnished with four ribbons.

The belly-piece is of an elongated oval shape; it extends from four inches to a foot in its greatest diameter; is made of spiral springs of brass wire, like the elastic springs of a pair of suspenders,

laid parallel, in the direction of the lengths of the piece, and supported by being stitched between two pieces of linen. This piece covers the pad; it has in it four holes; and four buckles, two at each end, are fastened to its outer surface. The belt should be long enough to go round the abdomen, from one end to the other of the abdominal piece, so that in arranging the three parts of the bandage, the pad which lies on the tumour is covered by the belly-piece, and the strings pass through the holes in the latter, and are tied on its outer surface, the belt encircling the abdomen behind and laterally; the straps, which are passed into the buckles of the belly-piece, keep the whole apparatus together in a single system.*

* Of all the trusses which have been invented for the cure or alleviation of hernial protrusion, none has perhaps so perfectly answered the end, or has given such general satisfaction both to the patient and to the practitioner, as that of Dr. Amos G. Hull, now of this city. That the merit of originality, as well as of ingenuity, is due to this gentleman in his discovery and its adaptation, seems to be now no longer disputed; the testimonials of the excellence of his truss are very numerous, in the highest degree commendatory, and perfectly to be relied on. It has no strap or thigh piece, but clings to the body by its own elasticity and the accuracy of its fit.

It has undergone many improvements at the hands of its inventor, and the latest and most perfect contrivance is composed, first of an elastic iron spring; secondly, of a back pad, and thirdly, of a rupture pad. The plate for the cushion is slightly concave, and the cushion itself full and elastic, by which the edges of the ring are approximated. The rupture pad has a lateral motion to either side, and may likewise be thrown more or less obliquely forward by a circular rotating inclined plane placed upon the pad, so as to vary at pleasure its points of relative pressure. To the patient, who can himself adjust it, this is very convenient in many changes of position, as in that in riding, for example; and it is likewise made available for the cure of the largest *varicocele*, without danger to the testis or the chord. Of this a case is recorded by Dr. G. Bushe, in the Med. Chir. Bulletin, Vol. II., No. 5. The principle is one which may be adapted to the cure of hernia of every description; and a femoral hernia truss, and also one for a double rupture, in which the pressure of the second pad is regulated by a cork wedge, are constructed by Dr. H. in the same way. The trusses are durable, strong, easy and accurate of adaptation, always relieve, and very often cure.—*Trans.*

OF CUTANEOUS IRRITATIONS AND ARTIFICIAL ULCERATIONS;

And of the Means of producing them.

By the terms issue and exutory, are meant artificial wounds or inflammations, which are made for the purpose of creating and keeping up on the surface of the body a long continued irritation, the effect of which will be either to lessen or do away with an internal inflammation, more dangerous to the existence of the patient; a practice founded upon Hippocrates' famous aphorism "*Duobus doloribus simul obortis, non in eodem loco, vehementior obscurat alterum.*"

The use of this class of therapeutic agents is manifestly of the highest importance, as from their united action, when well directed, the practice of medicine in a great measure results. The alvine canal, like the skin, presents a passage open to the derivative method, and, if we scrutinize the mode of action of many medicines which are taken internally, such as emetics and purgatives, in cases wherein no local disease, as apoplexy, an exanthema, &c., calls for their use, it will appear that these agents produce a revulsive action upon the gastro-intestinal mucous membrane, or inner integument, which is analogous to that created by blisters and issues upon the outer skin. The sensitive surface, however, of the intestinal tract, is a dangerous situation for the establishment of artificial irritation, the duration and activity of which it is difficult to control. By being obliged to act at once upon the entire intestinal mucous surface, we engender, in the system generally, a violent movement of excitation, which cannot often be repeated with impunity. This kind of irritation then is only proper in certain acute diseases, in which prompt and energetic revulsion is demanded. On the con-

trary, artificial irritation on the cutaneous surface, is, by the readiness with which its duration, extent and intensity may be limited, attended with the greatest advantage; and upon this very account is one of the most powerful of therapeutical measures. The utility of its application, in acute diseases, is surpassed only by that of sanguineous evacuations; and the latter even are inferior to exutories, in a majority of those cases which are complicated with nervous affections. In chronic phlegmasiæ, cutaneous irritation is one of the most heroic agents in medical therapeutics; and both medicine and surgery are reaping from it the most invariable and unequivocal benefits.

Three methods are in use for producing an irritation or ulceration of a derivative tendency upon the skin; viz: rubefacients, epispastics, vesicatories or blisters, and caustics. The former act quickly and actively, and are generally employed in acute diseases; the action of the latter, being susceptible of longer continuance, is preferable in phlegmasiæ of a chronic character.

OF RUBEFACTION.

Rubefacients are stimulants which we apply upon the integuments to produce there a momentary afflux of blood. Their action is attended with an increase of local sensibility, slight swelling and vivid redness. These appearances speedily disappear of themselves, after the removal of the cause which had produced them. If too long continued, they cause a secretion of serum, which raises the cuticle in the form of phlyctænæ; in which event, the agent becomes a vesicatory. Vesicatories operate by causing high irritation, speedily followed by phlyctænæ, but subsequently to the production of rubefaction; and therefore, notwithstanding that blistering is generally effected by appropriate means, it is, nevertheless, in fact, only a necessary consequence of prolonged rubefaction, and the remedies which bear those different names differ in nothing but the degree of their activity.

Among the rubefacients, some act upon the system at large; and their use belongs as much to hygiene as to therapeutics. Such are, frictions with soft brushes and downy substances, either dry or impregnated with aromatic vapours; they stimulate subjacent organs and the capillary circulation, and have a happy effect in scrofulous and lymphatic diseases. Flagellation, immersion or ablution in very cold water, or in water at a heat some degrees above that of

the human body, insolation, exposure to cold winds during a walk, &c., are all different means which act in an analogous manner to the preceding, and increase the tonicity of the tissues. Amongst the rubefacients whose chief effects are local ones, we reckon pediluvia of irritating quality, and sinapisms or poultices into which the flour of mustard, garlic, pepper, pimento, &c. enter; the use of these as revulsives is very common and important in all serious inflammations, loss of intellect, visceral affections, &c.; liniments made irritating by the addition of ammonia or tincture of camphor, which are chiefly used in neuralgia; and alkaline, acid, salt and vapour baths; which are different means, proper in a diversity of cases too extensive to be enumerated.

OF VESICATION.

The term vesication always supposes the formation of phlyctænæ and an inflammatory congestion of the rete mucosum. This condition is called the vesicatory. The word vesicatory is only relative; it is used both for expressing the topical application which causes the blistering, and for the effect, or vesication itself. A blister after it has been established will tend spontaneously to cease discharging, unless a new cause of irritation be kept up on its surface by reiterated applications of epispastic substances. The continued inflammation and consequent suppuration which they induce may last for a very long while; but they at length effect the destruction of the rete mucosum and cutis itself, cause ulcerations, and thus become changed from simple blisters into agents of cauterization.

Two sorts of vesicatories, as it regards their effects, are known; the *evacuant*, and the *revulsive*. Besides this technical distinction, and with respect to its intensity of action, and the length of its application, the name of *hasty or flying blister* is given to that which is left on but a few hours, or which is not repeated after having been on a sufficient time; it is applied to that also which is carried about from one spot to another, for the purpose of producing at each a revulsive effect; and lastly, that which is kept irritated in a continued way is called a *permanent* blister.

Substances which are capable of producing vesication are as many in number nearly as those which cause redness; although, but a few only are employed. The basis of most epispastic plasters is the powder of cantharides. A tincture of the fly serves in preparing the blistering silk; and lastly, we use boiling water, and the

ammoniacal pomatum; the bark of the spurge olive (mezereon), a rubefacient of feeble power, is now no longer used.

A blister may be applied to every part of the body, according to the end which we propose to ourselves by its use. When placed on the head, it is laid upon the sinciput behind the ears; when on the neck, upon the nucha; on the chest, in different places, opposite to the seat of pain; on the back and front of the abdomen; and in every part of the length of both upper and lower extremities.* When there exists no particular reason for selecting a spot, a very convenient place for the patient is the anterior surface of the left arm, as he can then dress it himself.

The skin must be shaved before tho blister is applied, and then be rubbed with a piece of linen dipped in vinegar, to invite an afflux of blood to the part; then we lay the blister plaster flatwise upon it, having first warmed it to aid it in sticking; two strips of adhesive plaster are placed crosswise upon it to prevent it from becoming detached; it is covered with a compress several times folded, and the whole is secured by a turn or two of a bandage. In twelve hours, blistering will be complete; and after the lapse of this time it is customary to remove the plaster. This being done, we shall perceive a large phlyctæna of the same size as the plaster. When any thing is to be gained by causing acute pain, we tear off the pellicle formed by the detached epidermis; by which, thousands of filaments, each of which is a sudoriparous canal distended with fluid, are lacerated, and give exit to a yellowish serum interposed between them. Beneath, we have the mucous surface, vividly red; the contact of the air and of the dressings upon which are extremely painful. If we can spare the patient this suffering, we take hold of the pellicle with forceps, and cut it all around with sharp pointed scissors. It is then dressed with a beet or cabbage leaf, some blotting paper, or an old rag, besmeared with fresh butter or cerate, and of the shape of the excoriation. This does very well for the first few days, but if we intend to keep up the suppuration, we must, so soon as the blister appears about to dry up, dress it with the epispastic pomatum, consisting of hogs'

* Blisters have been applied on every part of the circumference of both upper and lower extremities, and the trunk, to check the progress of erysipelas in these parts, which they do very effectually; and also upon the perinæum in males, and over the sacrum in females, in cases of paralysis of the bladder, &c.—*Trans.*

lard and the pulverized cantharides; or with the active principle of the powder, discovered by M. Robiquet, and by him called "*cantharidin.*" The irritation which this salve produces is often extreme; a whitish, dry, and granular film forms upon the surface of the wound, and inflammatory swelling with numerous miliary pimples appear in its vicinity. To allay these symptoms, all that is required is the application of an emollient poultice; the white film falls off, the swelling recedes, and suppuration reappears. If the pomatum proves too irritating, we must, in using it, dilute it with butter or cerate.

In England, the suppuration from a blister is kept up in preference, with an ointment of savine in powder or extract. One of the most commonly adopted formulæ is that of Mr. Crowther, and is as follows:

R. Pulv. Sabin. Fol. recent., ʒij. Ceræ flavæ, ʒj. Axung. Porcin. ʒiv. M.

The pomatum of the powder of savine leaves is considered in London to be less irritating than that which is made with the cantharides, and we are assured that it keeps up the discharge for a much longer time. After a certain time has passed, say a month, six weeks, or two months at the utmost, the blister becomes disposed to dry, and, if we strive to overcome this tendency by the repetition of epispastic applications, fungous granules of a livid colour, and bleeding on the slightest touch, form upon the dermoid surface, the texture of which is destroyed. From this results an ulcer, not easily curable, and one which after it is cured leaves a large and ugly scar. As this is a case which can only happen when it is desirable to keep up irritation for a long while, it is better, at an early period, to make the blister into an issue; an effect which is brought about by covering the sore with a piece of linen spread with cerate, and perforated in its centre with a hole through which a pea is passed; a small graduated compress is laid over this lightly, and the dressing is supported in the usual way; the pea is not long in creating a cavity, whilst the remainder of the wound being irritated no longer, promptly heals. To the cantharides there is one very serious objection; they powerfully stimulate the genito-urinary apparatus, and are sometimes productive of retention of urine, cystitis, satyriasis, or nymphomania; and they act at times as irritants upon the whole nervous system. All these symptoms, when taken in time, and at their commencement, generally subside upon discontinuing the cantharides, and employing baths and diluent beverages.

Blisters of boiling water are employed when we desire to produce revulsive effect very speedily. In the progress of long diseases it is a means of surpassing power, and when debility and obtuseness of sensibility demand prompt and active measures. The best way of using them is to steep a small compress folded eight or ten times, or a mass of linen arranged like a tampon, in boiling water, and to apply it at once on the selected spot. It is an exceedingly painful application, and must not last more than a few seconds, beyond which time the effect would be cauterization.

We remember to have once heard it said by M. Hallé in one of his courses of lectures, that in a case in which danger was imminent, and the patient senseless, he had restored him to consciousness by two large blisters of boiling oil, instead of water which is generally used. This means might again be resorted to under appropriate circumstances; although blisters made with liquid substances, owing to their fluidity, are objectionable from forming inflamed furrows upon the parts, which inconvenience the patient in his movements, and distress him with useless pain. We should prefer to them one of the two following means, which are of more recent application. The first consists in keeping upon the part for a suitable length of time, a silver vessel shaped like a kettle-drum, containing some burning spirits of wine, which is to be sufficiently hot before it is applied. The second, which strikes us as the more ingenious, and the most certain in its effects, originated with Sir Anthony Carlisle; it is made with a double folded piece of linen moistened and laid upon the part which is to be blistered, over which compress we then pass a nummulary or flat cautery iron heated to be of a reddish brown. This blister is in fact the same as that made with boiling water, but is superior to it in being instantly produced without several re-applications, and as it can have given to it precisely what form and size may be thought proper.

The pomatum of M. Gondret, moreover, is under some circumstances, a tolerably quick way of establishing successively and at will, rubefaction, vesication, or even cauterization itself. It consists of equal parts of hogs' lard and concentrated ammonia, in the form of a soft soap which is spread upon linen of size and shape sufficient. Rubefaction is effected by the application in two or three minutes; vesication in ten at the outside; and an eschar generally at the expiration of twenty five. Owing to the easy decomposition of this pomatum, from the great volatility of its active principle, its

energy not being constant, it has been recommended more lately to use in preference the ammonia itself. For this purpose we cover the part with a piece of diachylon plaster, pierced with a hole in its centre as large as the sore we mean to produce. Then steeping a linen rag in liquid ammonia, and squeezing it, we apply it to the skin through the hole in the diachylon plaster. Owing to the very great energy of the medicine, it ought to be carefully watched. The skin is next washed, and dressed in the usual way. This vesicatory, which is nearly as speedy and not as painful as boiling water, is useful in the same cases, and may under any circumstances, be substituted for plasters made with cantharides. The only objection to ammonia is its suffocating smell, which many patients cannot endure.

Lastly, the objective cautery is looked upon as vesicatory, and used to reanimate the vital functions in white swellings, lymphatic engorgements and atonic ulcers. Two kinds of heat produce the effect; viz., that of the solar rays concentrated by a lens into a focus, and directed on the diseased part; and secondly, the approach of a heated body or one in a state of ignition. The first method is the best for it is easy and always at hand. The heat ought always to be continued long enough to produce severe pain; its effects, which are seldom productive of more than rubefaction, ought never to exceed the raising of a blister, or the operation will become a true moxa.

CAUTERIZATION.

The effect of cauterization is to destroy the organization and vitality of the tissues. Two classes of agents possess this property; first, caustics properly so called, or the *potential cautery;* secondly, caloric, and bodies into which it has penetrated, or the *actual cautery.* They first cause the formation of an *eschar;* for so that portion of the tissues which have been deprived of life by the cautery, is called. Cauterization being in many cases indispensable, we shall enter into some details as to its agents and their effects, that we may not have occasion to return hereafter to the subject.

Cauterization is made use of to meet several indications; first, to create issues (*fonticuli*), or artificial ulcers, on the tegumentary surface; secondly, to destroy fungous and cancerous tumours, and arrest the progress of the caries of bone; thirdly, to check an hæmorrhage, when ligature and the tampon are insufficient or

impracticable; fourthly, to reanimate vital energy in languid parts, for instance in the fibrous tissues of the joints, in scrofulous habits of body, and in persons worn out by the long continuance of disease; fifthly, to decompose, deep in the bottom of wounds, poison or virus instilled by the bites of venomous or rabid animals.

Caustics are used in very various forms. We shall enumerate only the most common. First, the *Solid;* viz., the alkalies potassa and soda prepared with alcohol, the nitrate of silver, the deuto-chloride of antimony, and divers troches or dry pastes which have for their bases the deuto-chloride of mercury, and the deutoxide of mercury, lead, arsenic, &c. and burnt alum. Secondly, the *Soft;* which are solid pulverized caustics; inviscated with some fatty substance, honey, or merely water, so as to make a soft paste to be spread upon the diseased part; among this number are numerous ointments; highly alkaline soaps; the ammonical pomatum, and the arsenical paste. Thirdly, the *Liquid;* the concentrated acids, viz., the nitric, sulphuric, and hydrochloric, saturated solutions of potassa, soda, or ammoniacal gas; also of the nitrates of silver and mercury, sulphates of zinc and copper, and the deuto-chloride of antimony and quicksilver.

Of the three states in which caustics present themselves, the solid forms in powder or in troches are least employed. Many of them require extreme caution in their application, such as arsenic, lead and mercury, which have sometimes given rise to symptoms of poisoning in very irritable persons, or in persons in whom absorption was very rapid. The arsenical paste, however, is worthy of a separate mention, because of its admirable effects upon cancerous tumours of but little size and extent. Troches have fallen into disuse, and the chloride of antimony is most used in the liquid state. Not so with dry alkalies, which are often resorted to in opening chronic abscesses, and for establishing issues; nor with nitrate of silver, of which, owing to its daily employment in surgery, we shall immediately treat. It is run into moulds, made as little cylinders about two lines in diameter. It is kept in a *porte crayon* screwed into a sheath, in the pocket case of the surgeon. Its uses are to depress fungous or flabby flesh on the surface of wounds, exuberant vascular and cellular granulations, and to arrest hæmorrhage from leech-bites, &c. In using it, the wound is dried of the fluids which moisten it, and the caustic is passed over its surface, graduating the pressure according to the depth to which the cauterization is to be

carried; we wipe the nitrate of silver before it is put back into its sheath, to prevent it from forming a crust on its surface which would impede its effect the next time it was used, and which would require to be scratched off. The contact of the lunar caustic produces an evanescent but acute pain; the eschar is white and very thin; and is removed at each dressing.

Liquid caustics are laid on with a brush, or a pledget of lint at the end of a stick, or quill, &c., which is dipped into the cauterizing material, and laid on the diseased part, going down cautiously, if the wound is straight, into its depth. Their application gives great pain, and it is difficult to control their effects. They are chiefly admissible, the hydrochlorate of antimony in particular, in bites of mad or venomous animals, in which the injury is so serious that we cannot cauterize too deeply for the safety of the patient.

We apply heat in two ways; by the burning of some ignited substance upon the tissues themselves, which constitutes moxas; and by the application of very intensely heated substances, such as the metals, and steel particularly. The latter are called cautery irons, and their shapes correspond with the effects which they are intended to produce.

The usual effect of a caustic is the generation of an eschar, which will vary in depth, consistence, and colour, according to the cauterizing substance selected. For instance, when sulphuric acid and the alkalies are used, it is black, and when nitric acid is employed it is yellow. That which is produced upon living muscles by lunar caustic is white, but upon the epidermis, it is violet black. Generally, however, the eschar which is formed is a black or brownish pellicle, more or less intense, and in which carbon, set free, predominates over the other elements. Animal decomposition is effected by a true combustion; but, as an effect of pure caloric, that combustion is simple, and such as a high temperature and the presence of air or oxygen necessarily create in very combustible substances; whilst that from caustic is the result of a play of chemical affinities, and we have then a double decomposition. The dry alkalies, and concentrated sulphuric acid, for instance, have a tendency to seize upon the water which animal substances contain, or of the elements which form it; nitric acid gives up to them a portion of its oxygen, to produce new compounds, &c. All other caustics act in an analogous way.

The eschar, which is formed by many caustics, and the alkalies

especially, is moist. The animal detritus is more or less combined with an excess of caustic or the product of its decomposition, and makes in this way a kind of soap. From this circumstance, we ought always to remember to wash the eschar, whenever its extending too far would be detrimental. That caused by fire is, on the contrary, dry, and contains nothing differing from animal matter.

The subsequent effects of cauterization are, after a few days, the appearance of an inflamed areola around the dead part. This inflammation has been termed eliminatory by M. Dupuytren, and is intended to effect the separation between the living parts and the eschar, which has now become a foreign body. Suppuration soon commences in the living tissues; the eschar, detached at its edges, rises at the end of some days, and falls off, either in portions or in a single piece. If its healing be afterwards impeded by the insertion of peas, it takes the name of an issue.

OF FONTICULI.

The Issue.—A fonticulus, drain, or issue, is made in three ways; by cauterization, by incision, and by irritating a previously inflamed surface. It is resorted to in every case in which a very long continued irritation is required to be entertained, such for example, as chronic inflammations, paralysis and neuralgiæ. Formerly it was almost exclusively confined to the arm; now it is effected in almost every part of the body, care only being taken to avoid osseous and tendinous projections, and such parts as are but scantily provided with cellular tissue. That spot is every where to be selected for the establishment of an issue, which is surrounded by the attachments of muscles, or among their edges, in which but little motion takes place. Accordingly we make them at the origin of the nucha, between the separations of the trapezius and splenius capitis, in cases of opthalmia, otitis, and intractable cephalalgiæ; in the spaces between the ribs, in front or on the back at the lower part of the chest, in chronic pleurisy and pneumonic inflammation; in the right hypochondrium, in diseases of the liver; on either side of the vertebral column, in cases of rachialgia or paraplegia; and lastly, on the extremities, as derivatives, in the most extensive variety of cases; when on the thigh, the place of election is its inner and lower part, a little above the knee, upon the vastus internus, and in front of the tendons of the sartorius and rectus internus;

when upon the leg, a little below the knee, between the tibia and free edge of the gemellus internus; behind the tendons of the sartorius and rectus internus. But when there exists no cause for selecting one place in preference to another, the issue had better be made upon the arm, especially the left one, between the lower insertion of the deltoides outwardly, and within the outer edge of the biceps flexor cubiti, and inner insertion resulting from the bifurcation of the brachialis anticus; or upon the outer side of the insertion of the deltoid, betwixt the latter, the outer portion of the triceps, and the outer attachment of the brachialis anticus.

Potassa, prepared with alcohol, is the caustic almost exclusively employed for opening an issue. When pure, this alkali is white, dry, hard and brittle. When exposed for a brief space of time to the contact of the air, it robs it of moisture and carbonic acid, softens, and is changed more or less perfectly into a subcarbonate. When used under these circumstances, its effects are not to be depended on.

To make an issue, we first lay upon the part a piece of diachylon plaster, having in its centre a hole, which is placed opposite the spot in the integuments where the issue is to be: the hole should not measure in diameter more than a line and a half. Over this aperture we place a fragment of the potassa, the size of an hemp seed; and cover the whole with another piece of diachylon, larger than the former. A small compress and a few turns of a bandage constitute the requisite dressings. In a very little while an itching is felt, which is soon succeeded by a sensation of burning heat; in six hours the effect is produced. We should generally, unless we intend the issue to be large enough to contain several peas, avoid leaving the caustic on from morning till night, making too large an opening in the plaster, or using too large a piece of potash; experience having demonstrated, that under these circumstances, the slough, which should be from five to seven lines in diameter, is much increased beyond this, and may, in addition to effecting an unnecessarily extensive disorganization of tissues, be followed by the appearance of untoward symptoms in the system at large.

Upon the removal of the dressings, a little of the potassa employed is still visible, but much softened; the slough is saponaceous, and a black circle formed; a little redness and tumefaction exist around its circumference. The thickness of the integuments only ought to be involved in the effects of the caustic. Having washed

the part, we lay over it a rag or piece of blotting paper, spread with cerate, a flat compress, another circular one, and take a few turns with a roller bandage around them. The eliminatory process goes on with rapidity, and ten or twelve days suffice for the separation of the eschar. It sometimes happens that upon the second or third day the inflammation subsides, the eschar forming a dry crust, which will not drop off until the healing of the sore. If so, we must resolicit the inflammation by the use of the epispastic ointment. But if, on the other hand, the inflammation should be excessive, and be attended with fever, the symptoms are to be restrained by emollient poultices applied to the seat of the phlogosis, and the internal administration of cooling, refreshing drinks. If, lastly, it happens that the eschar when raised by the suppuration yet adheres to the bottom of the wound by a few vascular and cellular fibres, they are then to be detached with scissors. When the ulceration is bare, its cicatrization is to be prevented by introducing common peas, or those made of the Iris Florentina (orris), which are changed for others every twenty-four hours. It is customary to retain the peas with an ivy leaf spread with some fatty substance, and the dressings are effected as above mentioned. The peas, by their presence, encourage the suppuration from the subcutaneous cellular tissue upon which they lie.

In a few days, the edges of the ulcer swell, and enclose the peas within a cavity. As, owing to this, it might not be easy to withdraw them, it is customary to pass through them previous to their introduction, a thread whose ends are laid upon the upper part of the limb: this thread which is fastened down by an adhesive strip plays a twofold part; it aids in the extraction of the peas when too much buried in the ulcer, and in the other event, impedes their descent.

This method of establishing an issue is long and painful; but because it is irritating, and that for a long while, its derivative and revulsive effect is the surer and the more effectual. In some cases however, we prefer the use of the knife to that of the caustic, and in the following way perform its introduction:

Operation for cutting an Issue.

With the thumb and fore-finger of the left hand we make a fold of the skin longitudinally; then, with a bistoury held in the right hand, we cut through the thickness of the cutis; between the lips of the little wound thus inflicted, we place a pledget of lint, to keep them asunder, and act as an irritant to them. When, after the lapse of a

few days, suppuration is fairly established, we substitute a pea for the lint.

Lastly, in those who dread either of the methods we have now described, it has been proposed to induce vesication of the skin by the use of cantharides, or of the bark of the daphne mezereon, to a distance of some lines, and to convert this little blister into an issue, in the manner heretofore described. The great length of the process, and the pain to which it gives rise ought however to lead to its abandonment in practice.

We have already stated that caloric was applied in several ways; by the combustion upon the very tissues themselves of ignited bodies, which were called Moxas; and by the application of intensely heated bodies, called cauteries.

OF THE MOXA.

This name is given to a roll of inflammable matter, which is allowed to burn slowly upon the skin until it has caused its conversion into an eschar. The moxa produces effects similar to those of the issue, and is advised under the same circumstances; but its energy is greater, and its agency felt at a great depth amid the neighbouring tissues, owing to the progressive action of the fire. It cannot consequently be applied upon as many parts of the body as an issue can. The spots upon which it ought not to be placed are those on which the eschar might spread too widely, owing to the extreme delicacy of the integuments, long and tendinous protuberances, where its use might be followed by exfoliation, and because, moreover, bone like other solid matter, conducts caloric quickly to a great depth; and lastly, the known track of nerves and large vessels. Moxa is the most efficacious means known for the production of powerful and continued derivation. For sciatic neuralgia, it is applied opposite the origin of the nerves of that name, upon the lower part of the vertebral column; for paraplegia, upon either side of the spinous apophyses of the third or fourth lumbar vertebræ; opposite the part diseased in caries of the spine; over joints affected with white swelling, and in coxalgia, upon the great trochanter; but avoiding, upon the other articulations, the places we have named; and making an eschar of but little depth, for chronic affections of the lungs and liver, upon the parietes of the thorax and right hypochondrium, &c.

Several substances will do for moxas: viz., cotton, lint, tow, the

down of the mugwort, the agaric of the oak (spunk), &c. Carded cotton is the oftenest used; we twist it in such a way as to form it into a cylinder of a diameter equal to that of the moxa we intend to form, and usually about an inch. It is then surrounded with a piece of linen, which is strongly sewn, or else is covered outwardly with a thick coating of a strong solution of gum arabic, which is sufficient, when dry, to preserve its solidity. Having thus got a cylinder, we cut off a portion, about ten lines in height, which constitutes the moxa, properly so called.

The process of its application is extremely simple. The patient lies in such a position on his bed, as that the part on which we are to operate is uppermost; we then flatten very carefully each end of the moxa, to make them parallel, as the combustion is thereby rendered more uniform, an important circumstance in the formation of the slough; next, we light one end in the flame of a candle or with a live coal, moisten the opposite end with a little saliva, and place it at the selected spot, upon the skin. An instrument called a *porte moxa*, consisting of a ring of metal at the end of a long handle, has been invented for keeping it applied; but it is useless, and any flat rod of metal does just as well; we generally use the ring-handled forceps for this purpose, which are opened and applied flatwise. The combustion must be made to proceed as slowly as possible, a chief condition of the energy of the revulsive effect to be produced by the moxa being the gradual penetration of the heat, and the almost insensible increase in its intensity. Bellows are used to keep up the combustion; the wind produced in expiration may answer the purpose, but is a very inconvenient means for the person who is to create it; the irritation of the smoke upon the bronchia and conjunctivæ, often compels him to suspend the process; and it is much more simple to hold the moxa by the forceps in one hand, whilst with the other we direct upon the pipe of a pair of bellows, blown by an assistant with proper slowness and regularity. The pipe should be held at a certain distance from the burning cone, to equalize as much as possible the distribution of air upon its surface. It often happens that the combustion is active in one part and less so in others; but by a well directed use of the bellows, it may always be brought to spread with uniformity.

The patient, in the early stage of the operation, experiences only a mild and genial heat; but this soon increases to such a degree, as to become excessively painful. The skin around the cylinder

becomes vividly red; little drops of serum rise up all over its surface; and gentle oscillation and feeble palpitation of the subjacent muscles are perceptible. As the combustion verges towards its close, the skin contracts, dries, turns yellow and forms concentric wrinkles around the moxa. The intensity of the heat at this moment is intolerable, and the patient, unable to resist the agony he endures, often gives way to violence which force is necessary to restrain. When this point is attained, the principal effect is produced, and no time should be lost in putting a stop to the combustion. At its conclusion, a trifling report is heard, which is attributed to the bursting of some vesicles filled with serum, and by which the remains of the moxa are projected to a distance. The operation being ended, the pain ceases as it were by enchantment; the integuments around the burned part are rough, horny, and dry; in the centre, there remains a brown eschar, which is so much the deeper as the cauterization has been searching; this eschar is sometimes split up, involves the whole thickness of the skin, and sometimes even that of the adipose and subcutaneous cellular tissues themselves.*

The moxa is dressed with some fatty body spread upon linen; the part is covered with a circular compress, and a few turns of a band or of a body bandage, according to the seat of application, whether upon a limb or upon the trunk.

The eliminatory inflammation soon sets in, but it takes three weeks or a month for the detachment of the slough; and its fall is for some days before and afterward attended with profuse suppuration. To prevent this suppuration from drying up, and the cicatrization of the wound, we change the moxa to an issue; the number of peas requisite depending upon the extent of the ulceration, though usually about four suffice. They, and the dressings before mentioned when on the subject of issues, are to be daily applied; but, to prevent the separation of the peas, they are threaded by a common ligature, the ends of which are raised above the wound and kept there by a strip of adhesive plaster.

The tomentum or down which is obtained by pounding the dried leaves of the mugwort (artemisia latifolia) in a mortar, is used for making moxas by the Chinese. M. Sarlandière has experimented with this material, which he uses in a particular way, and applies several at a time, at distances of an inch apart. He kneads and

* To prevent the subsequent pain and inflammation from being excessive, the liquor ammoniæ should be applied to the sore.—*Trans.*

rolls it into cylinders, each as large as a hazel nut, between the palms of his hands; then, holding one end of the cylinder with the first three fingers of his right hand, flattens the other end against his left, and forms it into a cone, the density of which he increases by moulding it in various directions. Having in this way prepared the number of cones which he is to use, he moistens the places upon which he is to set them with saliva, causes them to adhere by their bases, and sets fire to their summits: after which the combustion goes on of itself. This method of applying moxa is easy and convenient; but it is objectionable by causing only a very superficial cauterization. It may be preferable in cases in which we may fear too extensive an action of the fire; but when our object is to produce a deep eschar to be followed by profuse and lasting suppuration, the common moxa is a better means.

M. Percy employed in the manufacture of moxas the pith and stalk of the large sun-flower (*helianthus annuus*), which he steeped in a concentrated solution of the nitrate of potassa, and afterwards dried with great care. This moxa is liable to the same objections as that of M. Sarlandière; it burns out too quickly, and the cauterization which results from it is not sufficiently deep.

The tempered moxa of M. Regnault, which is made of small cylinders of cotton but little pressed together, and about three or four lines in diameter, is also capable of but feeble action, and produces simply the effects of a powerful blister. It would appear that its inventor had derived much benefit from it in hydrocephalus, in which particular affection, among children, he has employed it. His practice is, to apply several, as agents of revulsion, along the course of the interparietal and parieto-frontal sutures; and, for the purpose of lessening the energy of the remedy, he interposes a disk of thick cloth betwixt the burning moxa and the skin.

It has been attempted of later years by some persons, to burn over the parts, by way of moxa, pieces of phosphorus, or camphor: but it would appear, from the first few trials which have been made, that the use of such means cannot be depended upon; the difficulty of controlling the combustion being such, that in some cases they are productive of too deep cauterization, whilst in others, on the contrary, they scarcely effect the rise of a trifling vesication.

OF THE SETON.

Although cauterization is not resorted to as a means of estab-

lishing a seton, we have been induced, from the analogy between their action, to take up its consideration after that of the issue and the moxa.

A seton is one of the most powerful of all exutories; and consists of a wound of two openings which is made with a cutting instrument through the skin and cellular tissue, suppuration being afterwards kept up from it by the use of a strip of bandage, &c., which passes through the wound.

To the places suitable for the introduction of the seton, more limits are assigned than for drains of other kinds. It is not long since they were applied only to the nucha; which even to this day is the spot most commonly chosen. Its use is advantageous in opthalmiæ, in otites, in chronic ozenæ, and in constitutional headaches; the remedy is beginning to be used upon the sides of the thoracic and abdominal cavities, in cases of chronic phlogosis of their respective viscera; upon the sides of the vertebral column in diseases of those bones; upon the large joints, when the seats of white swelling; in short, upon all places and in all cases wherein the issue and the moxa were formerly directed.

The advantages possessed over other exutory means by the seton are those of always keeping up secretion with great certainty, and in considerable quantity, owing to the great extent of irritated parts; and of acting more deeply and upon several tissues; consequently, as a derivative and evacuant, it brings about more speedily the resolution of chronic engorgement, and is admirably calculated to supply the place of and remove an habitual morbid discharge; its disadvantages are those of sometimes producing alteration in the neighbouring tissues, the more alarming the greater the depth to which its action is extended. On the other hand, as means of revulsion, the issue, and particularly the moxa, are attended with a primary and very often useful effect which modifies the vital properties of diseased organs on which their action is by sympathy exerted, whilst the seton possesses this excellence but in a much smaller degree, its primary action being similar to that of an issue established by incision.

We require for the insertion of a seton, the following instruments: first, M. Boyer's seton-needle, or else a straight bistoury. The seton-needle consists of a flat steel blade, about five inches long, six lines wide, and perforated at one end with a hole through which a strip of bandage is to be passed; the other end is sharp and

slopes in the form of a barleycorn lancet; the edges of the needle in the remainder of their extent are blunt; secondly, a stylet or probe having an opening at one end to receive the strip, in case of the straight bistoury being used for making the incision; thirdly, a strip of bandage somewhat worn, four lines in width, and having a fringe of the same extent projecting from either side. This is passed into the eye of the stylet or seton-needle, the small end is turned down and fastened upon the long one, and both are spread with cerate to cause them to adhere and to slip easily through the wound; fourthly, a cloth or guard, which is put under the place upon which we intend to operate, to prevent the blood from staining the garments of the patient or the bed; fifthly, a little soft lint, a compress, and a bandage.

All being thus made ready, the operator makes a longitudinal fold in the skin, by raising it with the thumb and fore-finger of the left hand; the upper part of this fold is held up in like manner by an assistant, that it may be made uniformly tense. The cutting instrument is taken in the right hand; the incision ought to be carried on a little lower at its exit; if the seton-needle be employed, it is made to pass rapidly through the integuments; we then seize it by its point, and pull gently upon it, in order to draw the greased band through the wound; when the smallest end is completely without, the needle is detached from it. If the bistoury, on the contrary, be employed, it ought to be held like the bow of a violin. Having passed the instrument quite through the tissues, its point is depressed with a sawing motion, to give the wound rather an oblique direction, which at a later period facilitates the exit of pus.* We now slip the stylet along its blade, seize it upon its appearing outside of the wound, and withdraw the bistoury, pressing a little upon its back so as not to cut any thing fresh; we then insinuate the strip as before mentioned, by pulling with gentleness upon the end of the probe with our left hand, and stretching the band with the other, in which way it enters with greater ease and less pain than if, being left pendant outside, it were made to force its way in at the lower angle of the incision. This linen strip, which is

* The instrument should not be introduced too low into the base of the fold, lest the muscles and parts which ought to be avoided might be wounded; nor too high near its edges, as the interspace between the wounds would then be very narrow, and the seton soon make its way through.—*Trans.*

used very frequently, is sometimes productive of too much irritation in persons endowed with much natural sensibility. If so, it will be better to give the preference to a wick of cotton-thread, two lines and a half in diameter. The contact of this wick is much more mild, and is borne even by the most irritable patients without complaint.*

When the operation is thus at an end, we dress the seton with a cake of lint, which is laid over the wound, and spread with cerate to prevent it from adhering; the cake of lint is covered by a small compress in several folds; over the compress we lay the long end of the strip of linen which we have placed in the wound, folding it upon itself for a number of times, until it is exhausted; and we secure the whole with a bandage whose circular turns will describe an apparatus suited to the shape of the parts in which the seton has been established.

The introduction of a seton is an operation more alarming to the patient in anticipation than it is painful in reality. It is not necessary to change the dressings until suppuration is established. The dressings are stained during the first few days with a serosanguineous oozing, and generally stick together; to remove them therefore, they should first be moistened with warm water. The wound and neighbouring tissues take on an inflammatory swelling, of such severity sometimes as to call for the use of emollient poultices. If the irritation were not to be allayed by their use, and we had inserted the linen strip, we might conclude that its presence was productive of excessive excitement and should substitute for it the wick previously mentioned. Suppuration is established on the fourth or sixth day; on and after which period, the dressings must be renewed every twenty-four hours. Each time that this is done, we stretch the two ends of the linen strip between our fingers, and

* It is customary in surgical practice, in this country, to use a skein of white saddlers' sewing silk, instead of the linen strip or wick mentioned in the text. It is to be dipped in sweet oil before it is inserted.

A neater and less troublesome seton is a French improvement, and consists of a thin smooth slip of elastic gum-tape, about four inches long and half an inch wide. It is drawn through the openings in the integuments, with a needle which has no eye, but holds it in the manner of a forceps. It is very cleanly, but slightly painful, and as it may be washed, does not require to be changed. When not sufficiently irritating, it may be smeared with a little savine ointment.—(Cooper's Surg. Dict.)—*Trans.*

draw out that portion of the short end which was within the wound; it is then cut off with scissors on a level with the orifice whence it issues. The pus which lubricates the surface of the wound enables the fresh portion of the strip of linen to glide easily through it. The latter should not be longer than two feet and a half, which answers for twelve or fifteen dressings; if it is of greater length than this, it lasts too long, and in the end absorbs fluids, which impart to it a putrid smell and injurious properties; the unpleasantness of passing it into the wound in this state may be readily conceived. When it has been nearly all exhausted by successive tractions, it is replaced by making a button-hole slit in the remaining portion, into which the end of a new strip is passed; this is also furnished with a slit through which its other end, and afterwards its entire length is passed in succession; it is spread with cerate, and by pulling upon the old one, the fresh strip enters and usurps its place. If the seton to be changed be a wick, the threads of the old one are to be circularly separated; the end of the new one is insinuated between them, being first rolled small between the fingers. The whole is secured in the shape of a spindle by a few turns of the thread, which is knotted; it is then greased, and the seton is afterwards introduced and managed as before mentioned.

A seton, when once inserted, suppurates in most persons merely by the irritation created by the presence of the foreign body; if, however, this secretion of pus is languid, it ought to be excited by besmearing the wick with some irritating material, such as basilicon ointment or the epispastic pomatum. The observance of this rule is rendered still more indispensable, if the disease for which it is made be one whose activity would increase in proportion as the irritation from the seton diminished.

The word seton, besides referring to the operation we have now described, is also applied to a wick or a strip which is introduced into solutions of continuity to promote the discharge of pus, to keep up the perviousness of a fistula, or to serve as a guide to the expulsion of a foreign body, such for instance, as a shell of bone, a ball or other projectile, a piece of the dress, &c. In such a case it is scarcely necessary to observe that a seton being placed there solely for the purpose of temporarily impeding cicatrization, it ought not to be continued after the removal of the cause which gave rise to its introduction.

OF CAUTERIZATION WITH THE METALS.

We have remarked that metallic bodies at a great heat applied upon tissues to effect their disorganization are called *cauteries* also, and thus bear the same name as that which is applied to express the ulceration which results from the use of caustics. Steel, from being infusible when heated to whiteness, from the difficulty with which it oxidizes, and its great capacity for caloric, is generally the metal selected for the manufacture of instruments for cautery. Of later years however, the substitution of copper for steel for this purpose has been proposed by M. Gondret. This gentleman has by numerous experiments acquired the conviction that copper, owing to its great powers of conduction and capacity for heat, converts parts, to which it is applied, into an eschar in a period five times less that that which it would require for obtaining the same effect by means of iron heated to a like temperature.

The cautery consists of a steel rod or stem whose upper end is wrought into a shape appropriate for the kind of cauterization which it is intended to perform; the other end tapers off, to be fitted at pleasure into a wooden handle. A hole, which traverses at their lower ends both the halves of which this handle consists, allows them to be closed by a pressure screw; so that one handle answers for several irons. The stem of the iron turns up at a right angle, just before the origin of the knob at the cauterizing end; an arrangement which allows of our carrying it with greater ease in several directions.

The shapes which the knob at the cauterizing end has received have given particular names to cautery irons, among which are the following. The *reed-shaped iron.* The only one which is not bent; it is employed for following straight and narrow sinuses and for acting at great depths. The *olive shaped cautery.* This it is easy to insinuate into small rounded cavities, such as cysts. The *conical cautery iron.* The truncated apex of the cone is its free extremity. It causes a loss of substance in the parts through which it passes of its own shape, and is useful where the action of the fire is required to extend from an outer surface deep down into parts below. The *hatchet-shaped cautery iron.* This little hatchet-shaped instrument has a quadricircular blade, extremely blunt: it is used for making streaks or *transcurrent* cauterization; and for attacking the bases of certain fungous tumours which are easily made to bleed. The

nummulary cautery iron. Its shape much resembles that of a quoit, and it is used for flat cauterization. The inner surface, which is to go upon the part, is slightly convex, which assists it in slipping. The edge around the instrument is rounded off for the same purpose. These flat irons are sometimes made square and oval, but are less used than the circular. The last shaped iron which we shall mention is that which M. Percy has constructed, and which he calls the *ring-shaped cautery;* it is a thick disk, excavated in its middle so as to resemble the crown of a trephine. It was used by its inventor for sincipital cauterization.

From the detail into which we have now entered, we perceive that each variety of cautery iron has its particular utility; but notwithstanding this, a surgeon, not always having this assemblage of instruments at his disposal, must learn to use one for the other, and even to make use upon occasion of the first metallic substance, copper or iron, upon which he can lay his hands.

Cauterization by means of fire is the most active of all; it is also the most advantageous, from the ease with which its application can be graduated and its effects limited. It is proper in almost every case in which the potential cautery is called for, and in most cases is preferable to it, but particularly for arresting the progress of hospital gangrene and of caries in bone. Its action, which extends to a great distance among the depths of tissues, re-excites their vital properties with great energy.

The heat at which cautery irons are used has a great effect upon their mode of action. It is customary to form some approximation to the degree of temperature by the colour of the irons as they come from the fire. The lowest degree of the heat is grey; next is dull red, cherry red, yellow red, and lastly white red, which is indicative of the utmost accumulation of caloric. The pain from a cautery iron is much greater when the disorganization of the tissues goes on slowly, than when it is quickly effected; in other words, when the iron is moderately warm than when it is very hot. The surgeon should never lose sight of this fact, that he may always be enabled to graduate the intensity of the heat in proportion to the effects which he wishes to produce.

Cauterization has received several names, according to the method pursued in applying it. The principal of these we shall now describe.

Inherent Cauterization.—This is effected by a sustained applica-

tion of the cautery iron to the part diseased; and is soon followed by disorganization of the tissues. But, for obtaining this result, it is necessary to employ the instruments at a high degree of heat. Ten seconds suffice, in a part which is moistened with fluids, to reduce a cautery iron to a dull red which was applied at first at a white heat. Therefore, whenever the parts to be cauterized are extensive, several irons should be used, and all heated at the same time in a chafing-dish filled with charcoal, the combustion of which an assistant excites with a pair of bellows. The operator, in this way, by substituting one cautery directly for another, is not exposed to inflict unnecessary pain upon his patient, by the occurrence of numerous interruptions in the progress of his operation. During the action of the heat, the tissues contract strongly and are quickly converted into eschars; their fluids either are decomposed, or go off in vapour, and in their passage to the gaseous state, absorb a large quantity of the heat applied. As the iron cools, the operator should exert less pressure, for fear that by drying, the scorched parts may adhere to the metal, and be torn violently away by its removal, which, besides giving pain, might result in an hæmorrhage. Wounds which are covered with a considerable quantity of fluid, should be sponged dry before the application of the heat. If blood flows abundantly from the capillary vessels during the operation, it should be hastily staunched before the iron is put upon the spot from whence it proceeds.

The inherent cautery, from the fact of its effecting the destruction of the tissues, answers the most various indications, and is that resorted to in the larger number of diseases, caries, fungus, deep-seated hæmorrhage, hospital gangrene, &c. Irons of every shape are used in its performance.

In the application of the cautery we should, as much as possible, avoid placing it on the track of nerves and large arteries, and upon bony and tendinous prominences, except it be over carious bones which are themselves to be cauterized. And finally, every time that the actual cautery is to penetrate among parts which it is important to preserve or useless to involve, we resort, in order to protect them, to felt or pasteboard canulæ, sprinkled with charcoal powder or steeped in a solution of alum or marine salt. These tubes are insinuated into the wound, and being non-conductors, they isolate the part from the contact of the heat, and permit the introduction of the cautery iron within their cavity. A linen rag several times folded,

made circular, and steeped in a saline solution, may be used in case of need as a substitute for them.

The severity of the symptoms subsequent to extensive cauterization is in proportion to the size, depth, importance and sensibility of the parts concerned; general fever, with or without nervous excitement, shows itself at first, together with an inflammatory swelling in the diseased part; at a later period, when the sloughs are cast off, occur profuse suppurations, and sometimes secondary hæmorrhages; nor is it uncommon to see, at some period or other, a sympathetic irritation developed in one or several of the viscera. All these occurrences are to be met and combatted by appropriate treatment. We shall not here dilate upon the different ways in which inherent cauterization may be modified to suit the various cases which call for its employment; and it is not from any want of conviction of its excellence in caries, fungus, ill conditioned ulcers, &c., all of which are diseases of major, and not minor surgery, nor, more particularly, in hæmorrhage deep down among wounds, and the bites of rabid animals, cases every where met with, and to oppose which it is essential that the surgeon be able to exert the best and most vigorous methods without delay, that we have not expatiated at more length on its general application.

Transcurrent Cauterization.—This is done with a hatchet-shaped cautery iron heated to cherry redness. The instrument is passed over the skin, and makes radii which are parallel to each other, and so far apart as that the cauterization, which should affect the thickness of the cutis, shall not convert all the skin between the streaks into a common slough. It is a very painful process; and the application of the iron is repeated until the effect is supposed to be produced. The radii, afterwards, assume a brownish hue, and the intermediate strips of integument become yellow. The sloughs, which are long and narrow, are detached about the twelfth or fifteenth day; they then expose longitudinal ulcerations, which discharge for some time, but generally not more than three weeks or a month. Stimulant liquids, in which compresses are steeped, are used as dressings during the first few days, to keep up the artificial irritation which has been created; as to the treatment of the eliminatory inflammation and of the fall of the eschar, the remarks made on the subject of issues are here again applicable.

Transcurrent cauterization is employed upon parts affected with chronic inflammations, such as rheumatismal and scrofulous white

swellings of the joints; it is used also in hydrarthroses, neuralgia, lymphatic engorgements, &c., in short, in all cases which require that tonicity be recalled, and capillary circulation increased among the tissues. It will be noticed, that in its uses, and the mode of its application, transcurrent cauterization bears a strong analogy to the moxa.

Objective Cauterization.—This consists in the application of a red hot coal or metallic body, at a certain distance from the seat of disease. The quickness with which an isolated coal grows cool in the air, makes the latter a far preferable method. The cautery iron, or the substance which performs its part, is generally held at a distance of about an inch from the affected part; this distance ought indeed to be proportionate to the elevation of the temperature; for the end at which we aim by the operation, is solely to reanimate vital energy, by increasing the activity of capillary circulation, and not to give rise to any disorganization of tissues; so that the name cauterization is improper, and given to it merely in consideration of the therapeutical agent by which the end is gained, The effect produced by the heat should be turgescence and redness, the result of a determination of blood thither, and tolerably severe pain, and the irritation should be pursued so far as to give rise to an erythematous inflammation sufficient to continue for some days after the operation. Directly that the capillary circulation has relapsed into its former atony, a new cauterization should be performed; recommencing thus several times, so as to produce effects upon the vital tissues analogous to those of permanent inflammation, such as results from transcurrent cauterization, and that by a series of successive stimulations, without the establishment of ulceration.

Objective cauterization is proper in the same cases as the preceding; but it deserves a preference when effects as violent can be dispensed with. Independently of chronic engorgements and scrofulous affections, it has been prescribed for reanimating the atonic ulcers of old people, and to give rise to the establishment of secretions of laudable character in chronic abscesses. It has been resorted to for the purpose of obtaining, by the constriction created by the heat, the reduction of herniæ, and prolapsus of the rectum and uterus; for suspending epistaxis, hæmorrhoidal hæmorrhage, &c.; but, besides the uncertainty of the therapeutical result, we cannot, in cases of this kind, venture to recommend the application of heat, which, upon surfaces so se sitive as are the mucous mem-

branes, might give rise to irritation yet more dangerous than the malady for the relief of which it was applied.

Of cauterization by the concentration of the solar rays, we think it unnecessary to speak. It is a very painful means, and one from which no benefits are obtained which are not obtainable by any other measure with even greater certainty. Neither will that cauterization which is effected by the medium of boiling fluids again engage our attention; nothing essential remains to be added to our remarks upon this subject in speaking of vesication.

We shall now take up in detail the consideration of those species of cauterization which, owing to the ease with which they are executed, or the great urgency of the cases in which they are demanded, may be or ought to be performed upon occasion by every surgeon.

The Cauterization of Poisoned Wounds.—Wounds which are inflicted by the bites of poisoned or rabid animals, but particularly the latter, are those of all others which most imperiously demand the use of the cautery, actual or potential. The symptoms and incidents attendant on such injuries, we shall treat of in our article on wounds; and are here only to consider the way in which cauterization is performed for their relief.

The wounds, whatever agent be selected for their cauterization, must first be placed in such a situation as that their depths can be easily reached; those which are closed must be opened afresh by incision, and those which are too narrow, must be enlarged by a section of all *frena* which constrict them.

It has been a question upon which there has been much discussion, what sort of cauterization it is best to employ for effecting the decomposition of the virus of rabid animals.

Actual cautery in general seems preferable from the speed with which it may be applied, and because, at every time and in every place, means for effecting it are always at hand. Some practitioners, however, condemn its use, alleging as a pretext the difficulty which is experienced in making the instrument penetrate into the depth and along the sinuosities of the wound, and the consequent uncertainty whether all the poison has been destroyed. M. M. Sanson and Bégin, who are far from admitting this to be a sufficient reason for dispensing with the actual cautery, think on the contrary that we are able, by its use, to change the parietes of the very narrowest

wounds into eschars, and conclude that there can be no agent more certain than fire for the decomposition of the virus.

I remember to have heard a doubt upon this subject expressed by a very eminent professor, which he asserted was founded upon facts. He proscribed the use of fire in the treatment of poisoned wounds, and grounded his opinion upon the following theory: that on the first instant of the application of the cautery the tissues contracted, and the fluids escaped at the approach of heat. By this movement, said he, the virus may be carried along, and not be decomposed, or at least not entirely; and confined behind the eschar, may still, after a time, develop its disastrous effects.

Whatever be the foundation upon which this opinion rests, it is in opposition to the experience of all practitioners, and therefore of no value but as a mere hypothesis; nor do we think that it can operate as a reason for laying aside the use of the actual cautery in poisoned wounds.

The reed and olive shaped cautery irons are better suited, from their shape, for the performance of this operation. They must be used at a white heat, and be made to penetrate to the very bottom of the wound. Every step is here to be pursued which was laid down in speaking of inherent cauterization. The iron should be held long enough in contact for us to be well assured, not only that an eschar of some thickness is produced, but that an entire decomposition has taken place in the substances at whose expense it is formed. Nerves and vessels in the vicinity, which have escaped the teeth of the animal, ought to be protected; but if we have the slightest reason to suppose them to have been in contact with the virus, they ought to be sacrificed without compunction.

When the eschar is created, we dress it as in analogous cases, waiting until the eliminatory inflammation has cast off the dead portion, and aiding the process by stimulating applications. It is customary to cherish the discharge as long as possible, with the view of assisting in the ejection of fluids, which were contained in the wound. If, in the present state of our physiological knowledge, the usefulness of this practice be not very apparent, we know at least of no sound reason why it should be rejected.

In France, caustics are more commonly used for obtaining the destruction of rabid virus, than the actual cautery. The most energetic, and also the most certain agents for this purpose, insomuch as they are not absorbed, are the concentrated nitric and sulphuric

acids, the powder or saturated solution of the nitrate of silver, and, above all, the butter or proto-chloride of antimony; for other caustics are uncertain, from not making an eschar sufficiently deep. The butter of antimony is a white, greasy looking, transparent salt; it readily absorbs moisture and deliquesces. The difficulty of managing it and of making it penetrate in the depth of wounds, has caused it to be used only in the liquid state, dissolved in water just made sour by the hydro-chloric acid.

When we are about to employ it, a brush made of a strip of linen or a few threads of lint twisted around a small stick, is steeped in the solution of the proto-hydro-chlorate of antimony; and, having been allowed to drain, it is passed into the wound, every part of the surface of which is carefully touched. The size of the brush will be proportionate to that, and to the length, of the solution of continuity. We will here repeat a remark which we before made, when speaking of fire as a cautery, that wounds which are too narrow should be widened and dilated, as much to admit of the introduction of the pencil, as to prevent the expression of the fluid before it has penetrated to a sufficient depth.

The caustic is decomposed instantly upon its application; it leaves a metallic crust of a bluish white hue, and beneath this a greyish, hard, dry eschar, about two lines thick. When wounds are moist, they should first be wiped dry, lest the contained liquids should weaken the caustic, or decompose a portion of it ineffectually. Blood in particular, according to M. Smith, directly produces this effect. It is hardly needful to observe, that if there should be reason to fear that the first cauterization was insufficient, we should repeat it without the least hesitation, for no danger can at all compare with that of the awful malady which the remedy is intended to avert. Poisoned wounds from the bites or stings of venomous animals, are much less common in our climate than those inflicted by rabid ones; and they are also much less dangerous, for the viper and the scorpion are, in France at least, the only reptiles which can give rise to accidents of this nature. It is seldom, that in these cases, we are compelled to resort to so violent a measure as that which we have above described. Generally all that need be done is to drop a small quantity of concentrated liquid ammonia into the wound. If, however, a more active means be thought advisable, we may cauterize it either with a fragment of caustic potassa, or with concentrated solutions of nitrate of silver or mercury, sulphuric or

nitric acid, or the chloride of antimony itself; always previously dilating narrow wounds, and in every other respect acting in the way we have above inculcated.

The Cauterization of Carbuncle and the Malignant Pustule.—This in no way differs from the preceding; only, whether actual or potential cautery be used, it is right always to precede it by an incision into the sloughs, or what is better still, to remove all the mortified parts with a bistoury, so that, the cauterization taking effect upon sound and sensitive surfaces, its action may tend certainly to decompose the morbific fluids or ultimate molecules which might, by their contact, cause a return of the disease. Of course, in cases so serious, the most energetic agents, fire and the butter of antimony, should be selected in preference to any others. Having already spoken at length upon eliminatory inflammation, the detachment of sloughs, of the necessary subsequent suppuration, and of the means of facilitating the occurrence of each of these events, we shall not here again repeat the observations.

Of Cauterization in an Hæmorrhage.—It will be stated in the article on hæmorrhage, that cauterization should never be practised except in cases, in which to arrest the flow of blood by pressure or the ligature, is impossible.

The parts by which sanguineous discharges are supplied, are of two sorts: first, vessels situated at a great depth; secondly, surfaces whence the blood escapes in a sheet. These may be cauterized either by fire or by caustics. The former method is very much preferable to the latter.

When blood is issuing from a deeply seated vessel which cannot be tied, or upon which ligatures have been ineffectually applied, it should be touched with the end of a reed-shaped or olive-shaped cautery iron, heated to whiteness. The motions of the operator should be quick and dexterous; he should touch the oozing point several times, hastily drawing back the instrument after each touch, lest the eschar, which is instantly formed, should adhere to the iron and be removed with it. If the hæmorrhage is troublesome during the operation, it should first be staunched with care; and, if the wound is wide enough to permit it, gentle pressure should be made on the orifice of the vessel with a little pledget or tent passed down on the end of a piece of stick or iron, until we are prepared to substitute the cautery iron for the instrument of pressure. We ought in every case, before we introduce the cautery iron, carefully

to separate and keep apart, by moistened rags, the lips of the wound, so that the heat may not act upon parts which it is unnecessary to involve. But, if the wound is too narrow, or the bleeding which is to be stopped springs from a greater or less depth within a cavity, such as the mouth, the vagina, the rectum, &c., we must resort to the employment of a speculum, and suitably protect its interior with moistened pasteboard or some other isolated substance, or by a canula of the kind already described, fastened upon a handle which the operator holds in his left hand, and with his right passes the iron down into its cavity.

When the blood is furnished by a twig of inconsiderable size, and the quantity which issues is not great, all ulterior hæmorrhage is in general prevented by applying a piece of calcined alum or of lunar caustic to the point of injury. Nitrate of silver is also used to cauterize leech bites, when they continue, after a lapse of several hours, to furnish blood, which threatens to enfeeble the patient; after which, each bite is covered with a little agaric or spunk. It is seldom that caustics are called for to arrest the flow of blood which issues in a sheet from the capillary vessels over a part. It is not our purpose to dwell upon analogous hæmorrhages, which originate from the erectile tissues or fungus hæmatodes; and indeed, what has been said above, will serve to guide our conduct under such an emergency.

Cauterization of Cancerous Pimples.—The skin, particularly of the face, is frequently the seat of small warts, or excrescences of a cancerous nature, which it is essential to destroy early by excision or cautery, to prevent their acquiring an increase of size at the expense of the neighbouring parts. These cancroid excrescences are seldom seen in any but persons somewhat advanced in years; sometimes they occur spontaneously, but are oftener the result of degeneration of those congenital tumours known by the name of *nævi materni.* They are particularly observed upon the cheeks and around the nose and orbits of the eyes. As the pimple grows, it becomes a greyish tubercle, knobbed like a mulberry in form, and adherent to the skin by a slender base. After receiving several accidental injuries, it falls off, and leaves bare a reddish ulceration, bleeding on the slightest touch; the adjacent tissues around it are thickened and indurated. If the tumour be not quickly removed when it has attained to this condition, it rapidly diseases the neighbouring parts, and ends in a cancer of the face.

Experience has proved that excision and the application of caus-

tics, and chiefly the arsenical paste among the latter, are the means best adapted to the cure of the superficial ulcerations of which we have now spoken.

The writings of professional observers contain a great number of facts which prove that symptoms of poisoning may arise from the application of arsenic to the exterior surface of the body. It would however appear that the occurrence must have been owing either to mistake, or to an improper mode of using it; for Sabatier, and MM. Dubois and Dupuytren, who have so often and for so long a time made use of it, and sometimes too upon large surfaces, have never witnessed any alarming consequences from its exhibition.

Three kinds of combinations, from the repeated success which has attended their employment, have enjoyed great celebrity; the powder of Rousselot, that of Brother Come, and that of M. Dubois. The composition of each of them is alike, and they differ only in the proportions of their ingredients.* That of M. Dubois consists of

R. Arsenici Deut-oxydi, ʒss. Hydrarg. Sulphuret. (vel Vermillion) ℥j. Sanguin. Draconis, ℥ss. M. These three elements are to be carefully ground and mixed in a glass mortar.

Before arsenical caustic is used, the parts must be prepared for its reception. If there exist a moriform crust or vegetation, it must be removed, or detached by means of emollient cataplasms; if there are fungous growths upon the surface of the ulcer, they must be excised, and then a small piece of lint or agaric be laid lightly over the wound; we are to wait for three or four days until these foreign bodies are cast off by a serous secretion.

Then in proceeding to apply the caustic, we lay upon the bottom of a plate, a quantity of it proportionate to the size of the ulcer which it is to destroy; we then pour upon this a little saliva, or a few drops of a solution of gum arabic in water, and inviscate the

* The value of arsenical escharotics in surgery, as remedies against cancer, the wounds made in extirpating them, which take on the same character, carcinomatous ulcerations, and above all the *lupus cum hypertrophia*, seems now incontestably established. In addition to *the pâtes* above mentioned, we subjoin "the powder of Dupuytren," from the 2d ed. of the Dict. de Médecine, Paris, 1833. It consists of a mixture of Prot. Chlor. Hydrarg, et Acidi Arsenios., in the proportions of one or two hundredths of the latter ingredient. M. D. recommends its use in children, women and irritable persons. A very small quantity only is applied by means of a little powder puff, and upon a surface not larger than a 30 sous piece at a time. It requires to be frequently repeated.—*Trans.*

powder with a spatula, so as to form a homogeneous paste of soft consistence. Taking some of this on the end of the spatula, we apply it to and spread it over the ulcer; and thus a stratum is made as thick as the depth of the eschar we design to obtain requires. This layer ought never to exceed a line or a line and a half in thickness; it should extend a little beyond the ulceration, even though the integuments around it have no appearance of disease; and it should extend as far as the induration, when this has travelled under a portion of skin not yet affected by the malady. In this operation we must take great care to confine the caustic to the parts which it is to destroy, and that the paste, by negligence in the application of it, does not form streaks, which if they were not to be carefully removed, would cauterize, or at least vesicate the parts beneath.

The layer of caustic being applied, we cover it either with a linen rag, or a light cushion of lint, but what is better, is a spider's web, which adheres more tenaciously; and a light bandage may, if thought necessary, be added to preserve the parts from external injury.

The action of arsenical paste is proclaimed by burning pain of greater or less severity, and by an œdematous and erysipelatous swelling of the integuments, which, particularly upon the head, extends all over the side of the face to which it was applied. This swelling lasts from two to several days, during which time the caustic dries, and when its action has been completely exhausted, forms a crust of a black colour, which becomes extremely firm. It never falls off before the twentieth or thirtieth day. After it is detached, there remains beneath a very much contracted ulceration of a vermillion redness, not depressed, and without any wrinkling of the adjacent skin, which goes on to cicatrize with surprising rapidity. When, at length, the cicatrix is fairly formed, it is smooth, white and even, elastic, and very much less disagreeable in appearance than those scars which result from other causes.

The use of arsenical paste is very convenient, and generally its application is followed by recovery; for, when the cancer is of any depth, we may, although the first cauterization was insufficient, repeat it a second and a third time, without any fear of exacerbating the disease,

Thirdly, the same caustic has been employed successfully for the destruction of thick callosities, which often impede the cicatrization

of old greyish ulcers, of a syphilitic character, and for checking the ravages of herpetic ulcerations. To the method of using it, which in the latter cases is the same as in those formerly described, we have nothing to add.*

ACUPUNCTURE.—(*Trans.*)

The translators with a view to render the present treatise more perfect, have ventured to introduce the following remarks upon a species of cutaneous irritation not alluded to by the author. It has of late received much attention abroad, and seems worthy of more notice generally than it has hitherto obtained.

The word is derived from *acus*, a needle, and *punctura*, a prick. It means the methodical introduction of a needle into different parts of the body, either as a means of cure, or of palliation. It seems to have been practised among Eastern nations, particularly the Chinese and the Japanese, from time immemorial. But its introduction into Europe was by Ten Rhyne, a Dutch surgeon, who published an essay upon the subject at London in 1683. In 1824, 25 and 26, it was considered with much attention, but the fervour of experimental inquiry has much diminished; and as happens to most new remedies, oblivion is now shading the measure which for a while filled every head with its wonders.

We employ for its performance any very delicate, sharp and highly polished needle; generally three or four inches in length, according to the depth to which it is intended to be passed. If made of steel it must be annealed, lest it should break off in the parts. Either a metallic head, or a knob of sealing wax should be given to its blunt end, that it may not wholly enter the organ. The needle

* Upon the subject of the dangers attending the use of arsenical pastes, the emphatic language of M. Cazenave, in the Art. Arsenic, in the Dict. Med. cit. deserves to be held in remembrance. "The local symptoms, which in appearance are really alarming, yield with surprising readiness to the simpler means; such as diluent drinks, pediluvia, leeches, or at most a small bleeding.

With prudence and attention in using them, we are certain almost of not encountering any of the accidents of which so many instances are recorded, and which probably, might always easily have been avoided. I myself, I repeat, have seen them applied, and have myself applied them a great number of times at the Hosp. St. Louis, and I never saw a single case truly untoward, or of any severity. Still, they are very energetic medicines, and demand the utmost prudence and the closest attention."—*Trans.*

being thus armed and the patient sitting or lying in a suitable position, we pass it in perpendicularly, either by a rotatory movement, or which is better, a slow and direct pressure, by which pain is lessened. Acupuncturation has no special seat of application, which is generally that of the pain; but arteries, nerves, veins, important viscera, the heart, brain, and spinal marrow had better be avoided.

The number of needles passed in varies according to the severity of the disease; but the more, perhaps the better, if they be put close together. They are left in generally from an hour and a half to two hours; but five minutes sometimes suffice, whilst at others twenty four or sixty hours elapse before their withdrawal. The pain is sometimes acute; at others, not complained of. In extracting them it is well to rotate them a little, and to support the skin with the thumb and fore finger brought close to the base of the instrument. It is seldom that the operation is followed by unpleasant symptoms, though it sometimes happens. Ecchymosis, tumefaction, syncope, &c. are seen, but easily remedied.

The theory of the *modus agendi*, is yet unsettled; for whilst many look upon the needles as mere irritants operating by revulsion, others suppose them to act as conductors and to effect a change in the electrical condition of the part in which they are implanted.

The remedy is used and has succeeded in neuralgia, paralysis, acute and chronic rheumatism, pain and stiffness of the joints, muscular contractions, hysteria, pleurisy, hiccough, anasarca, in preference to punctures, hydrothorax and aneurism; but again, in all these affections it has been ineffectually tried. Though variable, it is not without its benefits, and may deserve a trial in intractable cases which do not yield to other means.

The above remarks will be found to be translated from the 2d ed. of the Dictionnaire de Médecine, Paris, 1832, and are from the pen of M. Guersant.

THE SIMPLE OPERATIONS.

SANGUINEOUS EVACUATIONS.

Beneath this common head I have included, not merely phlebotomy, arteriotomy, and the application of leeches, but that also of cups and the bdellometer, which two means, the latter more particularly, are frequently employed for the detraction of blood.

BLOOD-LETTING.

Blood-letting is an operation whereby a certain quantity of blood is removed from within the body. It is performed upon three sets of vessels: first, upon veins, when it receives the names of *bleeding*, and those of *phlebotomy* and *venæsection;* secondly, upon arteries, when it is called *arteriotomy;* thirdly, upon venous and arterial capillaries, which is called *capillary bleeding*. The first two of these species are practised with a lancet or bistoury; the third is done entirely by leeches, cups, and the scarificator.

OF PHLEBOTOMY, OR VENÆSECTION.

The Indications.—A bleeding in which the sole object is to lessen the mass of blood, as in cases of plethora, is called *evacuant* or *depletory;* that which opens for the sanguineous fluid a passage in the vicinity of an inflamed organ, is called *derivative;* and that *revulsive*, which is performed as far as possible from the seat of congestion. Of these three terms, the first expresses an effect which in fact is a necessary one of all bleeding; but is useful as specifying the precise end proposed. As to the two latter, they seem, as has been justly observed by MM. Sanson and Bégin, to imply a contradiction in terms, for in derivative bleeding we are in hopes to empty the neighbouring parts, whilst, on the contrary, we endeavour in a revulsive one to solicit thither a determination of blood. The same commentators make the remark that derivation and re-

vulsion can only be produced by detraction of blood, by having recourse at the same time to other means, such as repellents on the inflamed part, when that can be done without danger, and, for example, ice to the head, in cases of congestion of the cerebrum, and the irritation induced by rubefacients and blisters upon a part away from the congested organ, as would be the lower extremities in the case supposed.

The Instruments.—The name of the instrument with which bleeding is practised, is a *lancet*, of which three sorts exist, distinguished from each other by the angle made by the point. The obtuse pointed are called the *barleycorn;* which form an angle of fifty degrees, and are advisable when a vein is superficial, and we mean to make a large orifice for the issue of the blood. The second kind are called *oat-pointed;* the angle which the point forms is from thirty-five to forty degrees; they are useful when the vein lies deep; but then, after having made the incision, we must raise the handle of the instrument to enlarge the wound in the skin and of the vein itself outwardly. The third kind, *the serpent tongued*, are very acute angled, and but little used.*

The Arrangements.—Bleeding is performed according to general rules. The patient will either sit upon his chair, or will lie upon the edge of his bed. We then proceed to search for the veins in the part wherein we are to bleed, and select always those which are superficial, large, not movable, and not too close to arteries or nerves. Before operating, we are to ascertain the situation of the arteries by the touch, which detects them by their pulsations. In order to distend the veins and make them prominent, the part just above, or below that selected, should be compressed: by the finger, if it is the jugular vein, or if in a limb by a bandage. We ought not to apply our compression in the latter way so tightly as

* In addition to *the thumb* lancet here described, an instrument called the spring lancet is much used in this country. This consists of a brass handle, on one side of which is a trigger, and at its smallest end a triangular fleam which is attached to a steel spring. For use, the spring is drawn back, and the blade set. The operator takes the instrument between the thumb and first phalanx of the fore-finger of his right hand; holds the blade over the vein at a height proportionate to its depth, and to the size of the incision intended to be made in it; then presses upon the trigger with the side of his fore-finger, which discharges the fleam into the vessel. Saving the difference in the instrument, the operation is in every other respect the same as that described.—*Trans.*

to impede the circulation through the arteries. We assist in filling the veins by a depending situation of the limb, and by immersing it in tepid water; not, however, to be long continued lest it might produce redness of the skin, and tumefaction of the cellular tissue, which would render the veins less perceptible. The patient is then directed to cause the muscles below the ligature to contract, and with the hand applied flatly upon and transversely to the limb, we make graduated pressure and gently crowd the blood from the branches towards its principal trunk. We generally succeed in a few moments in causing the repletion of the veins; but if not, we should continue it for half an hour at least before it is abandoned.

Difficulties in the Operation.—Sometimes, in spite of every precaution, the veins do not show themselves outwardly; which in persons inclined to corpulency, is of common occurrence. If the selection of a spot is a matter of indifference, and we cannot perform the detraction by leeches instead, we must look for a vein somewhere on the limbs, and tighten our ligatures. In some cases, in which the projection of the veins are not discoverable, they are detected in the dark by the shadow which they cast when a candle is passed around the limb; and feeling alone will sometimes indicate their presence when deep seated, by communicating the sensation of a cylindrical, resisting body, which swells and repels the finger when frictions are made from below upwards upon the limb. However, when a vein really cannot be found, and venæsection, as in case of apoplexy or intense pneumonia, is absolutely indispensable we are advised by M. Lisfranc to lay the cephalic bare at its upper part. It is always found in the furrow of cellular tissue which separates the adjacent edges of the deltoid and pectoralis major muscles. We should make an incision of an inch in length, parallel to the axis of the os humeri, with a convex bistoury; and after having divided the skin and adipose tissues, open the bared vein with a lancet.

There are again, other circumstances which add to the difficulties of bleeding; the chief are, the small size of the veins which furnish but little blood, the existence of the cicatrices of several former bleedings, which have the effect of narrowing the calibre of the vessel, and compel us to make our puncture below them; lastly, extreme looseness of the surrounding cellular tissue, which causes the vein to roll before the instrument. The latter inconvenience

may be overcome by fixing the vein firmly with the thumb, and making the incision perpendicularly to the surface of the vessel.

Requisite Apparatus.—The things necessary in performing venæsection, are: first, two good lancets, an obtuse one, and an oat-pointed one, so as to be prepared for any sized vein or situation which we may encounter; secondly, a candle to afford light if we are in a dark place; thirdly, a sheet to spread over the patient and protect his bed; fourthly, two single headed roller bandages; one to compress the spot above the vein, before the puncture, and the other to apply over the dressings afterward; fifthly, a compress folded several times, to lay upon the orifice; sixthly, a probe and a pair of dissecting forceps, to remove or put aside globules of fat, should any make their appearance; seventhly, some tepid water to wash the limb; eighthly, a bottle of eau de cologne, or of any other volatile stimulating substance, to be used in case of faintness; ninthly and lastly, two persons as assistants, one of whom will hold the light, and the other the basin.

The Operation.—Every thing being now ready, the operator opens the blade of his lancet at an angle of sixty degrees, and places the end of the handle between his teeth, having the shoulder of the instrument turned towards the operating hand; for, as a general rule, we must, except in the case of the arm, bleed from the left side with the right hand, and from the right side with the left hand. He applies the bandage, made of worn linen, by taking two moderately tight circular turns around the limb, at the distance of about two fingers above the place to be opened, and ties it in a bow. One hand is employed in supporting the limb which it grasps, and in stretching the integuments by means of the fingers on the one side, and of the thenar eminence and thumb on the other, so as to apply the integuments against the corresponding surface of the vein. This tension must be exercised equally on either side, that the same point in the integuments may be over the vein afterward as before they were stretched; if this caution be not attended to, when the skin is let go after the operation, parallelism is destroyed, and blood is infiltrated into the cellular tissue. Meanwhile, the other hand, by gentle pressure from the branches towards the trunk, drives the blood upwards; the thumb is then lowered to about two inches below the ligature, compresses the vein now distended with blood, and holds it firm and immovable. The surgeon takes the lancet in his operating hand, holding it betwixt the thumb on one

side, and the fore and middle fingers on the other, the ring and little fingers acting as a fulcrum outwardly; by executing a flexory movement, he brings the heel of the instrument into the hollow of his hand; presents the point to the vessel, and then, by a sudden and quick movement of extension pierces directly to the vein; and, if the lancet be very sharp, or the vessel deep seated, he enlarges the orifice by elevating its anterior edge and drawing it towards him.

We very often meet with timid patients, who draw away the limb at the moment when we are prepared to execute the operation. A case like this demands great dexterity on the part of the surgeon, who must endeavour to secure the limb immovably, and if he cannot succeed in this, must follow the motions of his patient, and avail himself of the first interval of quiet quickly to effect the puncture. The blood spirts out as we withdraw the instrument, and is received in a basin placed for the purpose. It is easy with a little practice to calculate the quantity which issues, which is exexpressed by the term *palette*, which holds about three ounces. At no bleeding is less than one of these *palettes* detracted, and I have often seen a large bleeding weigh a pound, which is about five *palettes*. When we conjecture that enough blood has been drawn, the thumb of the hand which supports the limb is placed over the orifice, and with the other the ligature is removed; next we wash the limb with a little tepid water; lay our small square compress, steeped in a solution of salt, over the wound; and secure it by turns of a figure of 8 bandage, with a single-headed roller band.

Different circumstances exercise an influence upon the rapidity and abundance in which the blood issues. The principal are: first, the obliquity of the wound. Whenever this is too great, the result is a want of parallelism, and the formation of a thrombus or infiltration of blood. Secondly, the direction of the incision as compared with that of the vein. In general, wounds made lengthwise afford but a feeble stream which soon ceases to flow; cross wounds, on the contrary, pour out a considerable jet of fluid; and those which cause a diagonal section of the vein, hold the middle rank. Thirdly, the shape of the incision; which ought to describe a trapezium, of which the largest side is constituted by the aperture in the skin, and the smallest by that in the vein: the blood, in this way, finding an easy vent. Fourthly, the extent of the wound; when the cutaneous incision is too narrow, we have a very small and delicate

stream of blood; the fluid speedily coagulates at the orifice of the wound, and is effused into the cellular tissue; on the contrary, a free orifice is in almost every instance beneficial, for the advantages derived from venæsection in inflammation, and in sudden and extreme congestion, are generally in proportion to the shortness of time in which the same quantity of blood can be abstracted. Fifthly, the tightness of the bandage. This ought to be moderate; if too loose, the blood, from being more inclined to pursue its course in its natural channel, flows but in small quantity from the wound; if, on the contrary, it is excessive, it obstructs or interrupts the circulation through the arteries, so that the gush of blood, which at first was free, stops suddenly altogether. In the one case, we must tighten, and in the other, loosen our ligature. Sixthly, the action of the muscles below the ligature; from these muscles the veins arise, and run over their surfaces, and their contractions first invite the collection of a greater quantity of fluid, and next quicken its progress.

Such are the principal circumstances connected with venæsection, which is followed by a flow of blood. It sometimes, however, happens, that after our incision is made, no blood, or very little follows; which is called a dry or white bleeding. Exclusive of the infrequent cases in which the surgeon has been mistaken as to the existence of a vein at the place of his incision, three causes more particularly give rise to this occurrence; the first is that owing to the rolling of the vein, it has not been wounded; secondly, we may have made too narrow an orifice. In either event we are firmly to fix the vein with our thumb, and to re-introduce the lancet. Lastly, the third cause is the interposition of some fatty globules between the lips of the incision, which oppose the flow of blood. We are then advised to remove them with forceps, or to put them aside with a probe; but it is very common to be obliged, in such a case, to make a fresh incision.

Untoward Events.—Beside the difficulties which attend and the defects which embarrass an operation as simple in appearance as bleeding is, numerous, and in many instances alarming accidents, frequently result from its performance. Such are: pain, fainting, ecchymosis, the infliction of a wound upon an artery, or upon the fibrous tissues, phlebitis, inflammation of the absorbents, &c.

Of Pain.—Pain after bleeding is frequently produced by the section of some fibrillæ of a nerve, and is to be treated by emollients. When it is very severe we may apply sedatives, or else re-introduce

the lancet, and complete the section of the twigs which we presume to be imperfectly divided.

Of Syncope.—Fainting occurs either before the bleeding, or when but little blood has flowed, and is then caused by the agitation of feeling experienced by the patient, and the disgust with which he is affected at the sight of the blood.* If from the first of these causes, circular ligatures, placed around several of his limbs, will speedily recall him to consciousness. If from the other cause, we stay the flow of blood, sprinkle the patient's face with cold water, and make him inhale aromatic and stimulating vapours, such as eau de cologne, aromatic vinegar, spirits or carbonate of ammonia, &c., which soon put a stop to the state of collapse in the heart.†

Of Ecchymosis or Thrombus.—This is a very common accident, the causes of which have been already detailed. It quickly yields to the use of resolvent applications.

Of the Wound of an Artery.—This accident is particularly liable to occur in bleeding from the arm, and above all in the *median basilic* vein. It is recognized by the occurrence of two streams, one bright red, the other black, or of a single spirt in which the two colours are blended; by the intermittent jerky motion of the redder stream, and its being synchronous with that of the heart; by the cessation of these appearances, when the principal artery above the puncture is compressed, and by their persisting after we have interrupted the circulation in the parts below by a ligature. When no doubt remains as to the nature of the accident, we should stop or at least impede the flow in the artery itself by compression, and apply the apex of a pyramid made of small square compresses over the orifice, laying them one over the other, the widest in succession as we go farther from the wound; then semiflex the limb, and maintain the apparatus by a figure 8 bandage. This temporary pressure allows us to wait until the ligature of the wounded artery can be performed.

Of Wounds of Fibrous Tissues.—It is not unfrequent to involve

* It is also produced by too copious an abstraction of blood, which happens accidentally from the inattention of the surgeon to the pulse of his patient, or is made to occur intentionally, for the sake of its equalizing effects upon the circulation in inflammations of serous tissues, &c.—*Trans.*

† To the above means, the addition of a perfectly horizontal posture, by which the blood may be directed towards the brain, should not be omitted.—*Trans.*

some part in the vicinity of the vein, consisting of ligamentous tissues such as a tendon, a fascia, a ligament, the periosteum, &c., in the incision. At first nothing occurs to admonish us of the injury inflicted; but after some time there comes on a dull pain, with doughiness or some degree of inflammatory swelling in the part; this, if not attended to, may progress and be serious; but when instantly prescribed for, generally disappears with quietness, baths and emollient poultices.

Phlebitis.—The inflammation of veins is rather a common disease; it is announced either directly by an acute pain which spreads along the principal trunk, and is soon followed by fungous swelling of the lips of the wound; or else, at a later period, by the formation of a few drops of pus below the cicatrix. A knotted, motionless, hard and painful cord, appears along the course of the vessels above the incision; a bad form of fever sets in; inflammation seizes upon the neighbouring tissues, and a number of little abscesses form in their substance. Though often an inconsiderable, this is at times a disease which proves speedily fatal, owing probably to the quick propagation of the inflammation of the venous vascular membrane to the heart.

The application of leeches, of topical emollient remedies, and the strictest antiphlogistic regimen, are proper in the cure of this affection; and, when abscesses have formed, it is better, in the estimation of M. Dupuytren, to cut the vessel across at short distances, to give free exit outwardly to the pus, and facilitate the adhesion of the walls of the vein.

Inflammation of the Absorbents.—The incision sometimes will not cicatrize; an œdematous puffiness surrounds it; a serous liquid oozes from the cut; and pain, with enlargement of the lymphatic ganglia is felt in the upper part of the limb, nor is it unfrequent for fever to declare itself. These symptoms, which are attributed to the opening of some absorbent vessels, may be cured by resolvent applications. If on their subsidence, there still remains a small fistulous orifice, it is to be touched with the nitrate of silver.

Such are the principal untoward events, which owe their origin specially to the operation of phlebotomy.

This operation is practised upon a great many veins; in the face, upon the vena preparata, or the frontal; in the tongue, upon the raninal vein; at the wrist, upon the cephalic of the thumb or some one of the veins upon the dorsum of the hand, the distribution and

size of which are always extremely various. Bleeding in any of these veins is very uncommon; but not so in those of the arm, foot and neck. The operation in these three situations, is resorted to: the former, in almost any event, but more particularly when a copious and rapid abstraction is required; the second, when a revulsive effect is to be produced; the latter to effect derivation in congestions of the brain and in inflammations of the face and hairy scalp.*

OF BLEEDING FROM THE ARM.

The Surgical Anatomy.—The skin which covers the fore part of the humero-cubital articulation is smooth, soft and thin, particularly in the bend itself. The appearance of this flexure is that of a whitish blue line rounded from its outer to its inner side, having a convexity downwards and a concavity upwards, around the bulging of the biceps flexor muscle, at its lower part. The upper part of the fore-arm when in extension, has upon it a slight depression, which is bounded laterally by the swell of the supinator muscles outwardly, and of the pronator teres within. When the limb is semi-flexed, the tendon of the biceps protrudes beneath the skin, at at the spot where the median depression had been. The whole of this portion of the tegumentary covering receives numerous twigs from the internal and external cutaneous nerves upon its inner surface. In all, except very fat people, the subcutaneous veins are visible through the integuments. Underneath the skin is the adipose tissue, which is never wholly wanting, and whose thickness, when it does not exceed three or four lines, is sufficient for pointing out the projection of the veins. These vessels, or at any rate those which are opened in bleeding, lie between the adipose tissue and the enveloping aponeurosis. Let us suppose them now to be laid bare; the *common median* vein creeps up over the anterior and outer part of the fore-arm; ascends from without inwards, from the lower and outer part of the fore-arm to the bend of the joint, in front of the tendon of the biceps, where it receives posteriorly two anastamoses from the radial and deep cubital veins. This junction being effected, the common trunk divides in front of the biceps' tendon into two

* Bleeding from the external jugular is frequently practised as a speedy and easy means of abstracting blood from fat children in anginose affections. That from the veins upon the dorsum of the hand, which are distended by its immersion in warm water, is likewise resorted to for a similar purpose.—*Trans.*

branches, which in their divergence include that muscle and form an angle of sixty or seventy degrees.

One of these two branches, the inner one, is called the *median basilic;* the outer, the *median cephalic;* the *median basilic* ascends towards the inner and upper extremity of the articulation, where it receives the anterior cubital, and empties itself into the basilic vein. During its passage between the projections of the inner edge of the biceps and outer edge of the pronator teres, it crosses the track of an aponeurosis, which is called the bicepital, and which, arising from the inner edge of the tendon of the biceps, aids, by its expansion, in forming the fore and inner portion of the anti-brachial aponeurosis, and separates the median basilic vein from deeper seated vessels. Behind this bicepital aponeurosis, we have, lying in a furrow which separates the two muscles above named, the following vessels, which are situated from without inwards, and at a depth of about a line and a half behind the vein; first, the *brachial artery:* which comes down from the inner and and lower part of the arm to join the middle of the articulation, following the convexity formed by the biceps at the lower part of its inner edge. This artery crosses the direction of the median basilic vein very obliquely; and a little above the bend of the joint, it divides into the radial and ulnar or cubital arteries. The veins of the same name send anastamosing branches which unite with those of the common median. It follows from this distribution, that for about an inch upwardly, starting from the division of the median veins, the median basilic vein lies in front of the brachial artery.

Secondly; The *deep humeral vein:* it is sometimes double. It lies on the inner and posterior side of the artery, covered by this vessel, and going a little beyond it. Its position, upon the whole, is not as constant as that of the nerve or artery. It is often to the outside of the latter vessel, but, in every case, is certainly behind it.

Thirdly; The *median nerve:* it is situated four lines more inwardly than the artery, and begins to cross the track of the median basilic vein at an inch and a half below its common bifurcation with the median cephalic.

Lastly, at about two inches from the point of this bifurcation, the median basilic vein empties itself into the basilic vein properly so called, upon the inner and lower surface of the arm; behind this vein runs the principal trunk of the internal cutaneous nerve.

Fourthly; The *median cephalic vein* passes toward the outer side

of the limb, between the outer edge of the biceps muscle, and the inner edge of the supinator longus, from which it likewise is separated by the aponeurosis. It empties into the cephalic, at two inches and a half from the common division: it is crossed obliquely at about fifteen lines from the same point, by the trunk of the musculo-cutaneous nerve, which passes down from the outer surface of the arm.

The *anterior cubital vein* may, when large enough, be selected for the operation. It joins the median basilic and posterior cubital upon the inner end of the joint, to form the *basilic vein.* The *radialis superficialis vein* ascends along the fore and outer surface of the fore arm; and by its junction with the median cephalic vein, forms the *cephalic vein* properly so called.

Now, from what has been said, it follows: first, that no spot can be designated upon the anterior surface of the bend of the arm, at which it is not possible to wound some twig, or other, either of the external or internal cutaneous nerve. But, unless the trunks themselves are wounded this need give no anxiety. Secondly, that bleeding is unattended with much danger, when performed in the course of the anterior cubital vein, the radialis superficialis vein, and the common median vein, unless it be at the upper part and the point of bifurcation of the latter, where some risk is run of wounding the brachial artery or some of its branches, or the median nerve. Thirdly, that bleeding from the median cephalic vein in the middle of its track, may involve the principal trunk of the musculo-cutaneous nerve; but, that in any other point, it may be cut with impunity. Fourthly, that a deep incision is dangerous at almost any point in the track of the median basilic vein.

The Operation.—But little remains to be said upon the subject of this operation, which has been before almost wholly described; the incision, however, should be made with the right hand of the surgeon when in the right arm of the patient, *et vice versa.* If we are about to bleed from the right arm, the operator places the right hand of his patient under his left armpit, and by pressing it with his arm against his chest, keeps it immovable; the palm of his left hand encircles the elbow of the patient; his fingers and thumb, coming up over either side of the joint upon its anterior face, serve to make the integuments tense. When the incision is made, the patient is desired to turn some round and not bulky body between his fingers, such as the lancet case, &c., to facilitate the flow of the blood. The

operation being concluded, the limb is semiflexed, the wound washed, a square compress laid upon it and a bandage applied. The bandage is put on the wound obliquely from below upwards, leaving one extremity pendant upon the outer and lower part of the forearm; the head of the roller is then carried successively inwards, behind, and upon the outside; we pass again, going downwards, over the anterior surface of the fold of the arm, and cross the direction of the first turn of the band over the wound, and thus proceed until the roller is exhausted, when we either tie both ends (taking a double turn of the tails within one another, to prevent their slipping) in a knot over the puncture, or fasten them with pins. The arm is to be kept for about twenty four hours in a sling.

OF BLEEDING FROM THE FOOT.

The Surgical Anatomy.—Both saphena veins may be bled in upon the inner or outer surface of the tibio-tarsal articulation. The skin covering the ankles is rough, thick, and unyielding: the adipose tissue thereabouts is thin; and there is beneath an expansion of the crural aponeurosis, which is continuous with the annular ligament of the tarsus.

Of the Vena Saphena Interna.—Being formed out of twigs from the dorsum and sole of the foot, it reaches the inner ankle. It usually consists of two branches. The *anterior*, and most superficial, is situated either upon the inner malleolus, or between it and the tendon of the tibialis anticus. In the first event, it is covered by integument, and as it is accompanied by the internal saphena nerve, it may be dangerous to cut it; in the second case, a few twigs from this nerve only cross it, and it is covered by a delicate aponeurosis. The *posterior branch* is deeper seated and lies upon the tibial aponeurosis, six lines away from the ankle, between it and the inner edge of the tendo achillis. Separated from this vein by a thick aponeurosis, and at a depth of about four lines behind it, lie the posterior tibials.

Of the Vena Saphena Externa.—This vein is composed of two branches and comes from the dorsal and plantar surfaces and outer edge of the foot. The *larger branch* passes at a distance of four lines below the ankle, following the course of the outer saphena nerve, from which it is divided by an aponeurosis, and comes up to take its station between the ankle and tendo achillis. The smaller branch, crosses the malleolus, and soon rejoins its fellow, to make

with it a common trunk, whose inner surface is in contact with the nerve.

The Operation in the Internal Saphena Vein.—The anterior superficial branch is that generally selected. The feet having been for some time immersed in a hot bath, the leg is encircled with a ligature above the ankles or below the calf, and its ends are tied upon the outer side of the limb. The operator takes his seat upon a low chair before his patient, and covers his knees with a folded sheet by way of a guard; seizes the foot, turns it gently outwards, and at the same time places the heel upon his knee. The saphena veins being very movable, they require to be previously fixed firmly with the thumb. The incision, when upon the left foot, is made with the left hand, *et vice versa.* The operation being completed and the compress applied, we leave the end of the bandage pendant over the outer edge of the foot; we then carry it diagonally upwards and from without inwards upon the dorsum of the foot, over the compress, the tendo achillis and outer surface of the leg; again recross downwards the back of the foot; continue on over its inner edge, sole, outer edge, and so on, so as to make the figure 8. Having exhausted the length of the band, its tails are tied upon the outer surface of the leg. This is what is called the *stirrup bandage.*

In the External Saphena Vein.—The operation is the same in this vein as in the saphena major, except that we apply our ligature a little higher up, and that, instead of the heel, the operator puts the sole of the foot on his knee. However, it is a bleeding but rarely performed, for the inner saphena vein is usually much the largest of the two, besides which, the situation of the nerve relatively to the latter, demands more circumspection on the part of the surgeon.

OF BLEEDING FROM THE NECK.

For this purpose the *vena jugularis externa* is always selected.

Surgical Anatomy.—The vein, which is made up of twigs which accompany the divisions of the external carotid artery, descends almost vertically upon the lateral parts of the neck. Upon its outer surface, it is covered by the integuments, adipose tissue, upper layer of the superficial fascia, and platysma myoides muscle, lying on the inner layer of the superficial fascia; its inner surface reposes upon the sterno-cleido-mastoid muscle, the oblique direction of which it crosses; around it are scattered numerous nervous fila-

ments coming off from the superficial cervical plexus; inferiorly, much fat separates it from the platysma, which diverges from it to form the expansion of the neck at its lower part. The vein continuing its vertical direction, passes behind the omo-hyoideus, and empties itself into the subclavian vein.

The Operation.—Bleeding in the jugular differs from that in any other vein, owing to the impossibility of making circular pressure around the neck. The want of this is supplied by the application of a small graduated compress upon the track of the vein, below the point at which we intend to puncture it.* Flatwise upon the compress is applied a band, and its two ends are brought in front of and behind the neck; an assistant then stretches and separates them, so as to press solely upon the vein. The vein is distended, and the subsequent flow of blood consequently expedited, by directing the

* In bleeding from the jugular vein, great attention must be paid to the position of the finger or compress below the puncture, as the introduction of air into it might be instantly fatal. "It distends," says Nysten, "the cavities of the heart and prevents its contracting on its contents, so as to fill the lungs with its fluids;" a peculiar *whistling* is heard, the pulse sinks, the patient grows pale, is convulsed and expires, either directly or in a very short time. The fatal instances of this accident are most common in operations. MM. Beauchéne, Dupuytren, Castara, Delpech, Sir Astley Cooper abroad, and in our own country Professor A. March, have all encountered fatal cases in their own practice; and Dr. Mott escaped a similar calamity, only by the narrowest chance, as will be seen by the following extract from the account of the *Exsection of the Clavicle* by that gentleman, reported in that very valuable and ably conducted periodical, the American Journal of the Medical Sciences for Nov. 1828; an operation as yet unparalleled for magnitude, difficulty, danger; and *unique*. In an operation which was undertaken *for the removal of a parotid gland in a state of scirrhus*, "the facial vein, where it passes over the base of the lower jaw, was opened in dissecting the integuments from the tumour, in the early stage of the operation, before a single artery was tied. At the instant this vessel was opened, the attention of all present was arrested by the *gurgling noise* of air passing into some small opening. The breathing of the patient immediately became difficult and laborious, the heart beat violently and irregularly, his features were distorted, and convulsions of the whole body soon followed to so great an extent as to make it impossible to keep him on the table. He lay upon the floor in this condition for nearly half an hour, as all supposed *in articulo mortis*. As the convulsions gradually left him, his mouth was permanently distorted, and complete hemiplegia was found to have ensued. An hour and more elapsed before he could articulate, and it was nearly a whole day before he recovered the use of his leg and arm."—*Trans.*

patient to make long expirations and to perform the motions of mastication. The blood, after the incision, flows generally in a sheet; it is caught in a playing card folded into a groove, the edge of which rests against and presses upon the neck just below the wound. When enough has been drawn, all further flow of blood is suspended by the application of a compress secured by a few loose turns of a circular bandage.*†

ARTERIOTOMY.

The necessary conditions for the performance of this operation are, that the artery shall be superficial, of small calibre, and lie over a bone which will allow us to compress it. Several arteries, the temporal, occipital, radial, tibialis anticus where it crosses the instep, &c., answer to these requisites, but notwithstanding, the operation is performed almost exclusively upon the *superficial temporal.* It is resorted to in active opthalmia, but more particularly in apoplexy, phrenitis, and whenever there exists too considerable an afflux of blood towards the brain.

Surgical Anatomy.—The superficial temporal artery is the termination of the external carotid. After it leaves the level of the outer angle of the eye, it is situated between the integuments and the temporal muscle. It gives off two branches; the one, *posterior,* which mounts perpendicularly over the parietal bones, and upon the sinciput anastomoses with that of the opposite side; the other, *anterior,* or frontal, which ascends on the sides of the forehead, and joins its fellow of the other side in an arch. It is this latter *anterior* branch which is generally opened in arteriotomy.

Instruments.—Before we proceed to make a section of the temporal artery, we are to provide ourselves with a bistoury or scalpel, a lancet being likely, from its delicacy of structure, to be broken

* We have the highest surgical authority for saying, that increased security is given by the application of *good* adhesive plaster over the orifice.—*Trans.*

† Besides the veins mentioned in the text, those of the scrotum are opened in swelled testicle, as an easy means of local depletion; a ligature is put around its upper part, and the whole immersed in warm water. When the venous distension is complete, the surgeon sitting before the patient, supports the bag in his left palm, stretches the integuments with the thumb and fingers, on either side, and opens the largest veins with a lancet. Several ounces of blood are in this way obtained; when it is desired to check the flow, we have only to remove the ligature.—*Trans.*

against the bones of the skull; two graduated compresses, and two bands, one a single-headed roller, the other a double headed roller, with tails of unequal length, and about six yards long.

The Operation.—We first assure ourselves, by the touch, of the position of the artery, which is detected by its pulsations. The thumb and fore-finger of the left hand press the vessel against the subjacent bone; in the space between them we introduce the scalpel, the handle of which we hold in our right hand, whilst the fore-finger, extended upon the back of the blade, governs and directs its motions. We offer its point to one side of the artery, lower the bistoury pressing it quite against the bone, and draw it towards ourself, so as to cut the artery crosswise. A red stream, flowing in jerks, which are synchronous with the beatings of the heart, announces the section of the vessel. When it is judged that a sufficient quantity has been detracted, we arrest the flow by making pressure with the finger below the incision, and between it and the heart. We wash the part; substitute one of the graduated compresses for the finger, and lay the other compress over and near to the wound, to guard against recurrent hæmorrhage by anastomosis from the upper end of the vessel. A few tight casts of a bandage generally suffice to control the bleeding. If, however, blood is still discharged, the *packers' knot* bandage must be put on in the following way:

We apply the flat of the bandage over the graduated compresses; then carry the two heads on the anterior and posterior surfaces of the head; cross them upon the opposite temple, and bring them again over upon the wound. When there, we change hands; the two tails being one above the other, are strongly drawn downwards, so as to bear upon the compresses, and caused to describe the quarter of a circle by a rapid motion made with both hands in an opposite direction; the one becomes uppermost and the other the lowest. We then take turns of the bandage vertically around the head, one above the sinciput, the other under the jaw; cross them behind, bring them up again upon the compresses, where, by a fresh knot, their vertical direction is again altered to a horizontal one, and so on until the short head is exhausted; the bandage is then completed by securing the whole by a few circular casts of the remaining globe. In order to guard against a return of the hæmorrhage, several days must be allowed to pass over before the dressings are removed.*

* We supply, by a translation of some parts of the article Arteriotomy, by M. Jules Cloquet, in the new edition of the Dict. de Médecine, Paris, 1833, a

OF LEECHES.—Zool. *Vermes.*

The leech, of which so frequent use is made in therapeutics, is an aquatic worm, having as its characteristic a long, flattened, slimy body, which is made up of a succession of rings or segments, ending at either extremity in a disk or sucker by which it adheres like a cupping glass. They constitute one of M. Cuvier's genera of the *branched annelides*, and of the *endo-branches* of M. Duméril. By MM. Savigny and de Blainville they have been classed as a family of the hirudinate or sanguisugous worms.

The medicinal leech, (*hirudo officinalis*) is distinguished from the other species of leech by having an oblong body about three or six inches long, depressed upon its upper and lower surfaces; its back in form is slightly convex, of a blackish brown colour, streaked with six yellow bands spotted with black; its belly is flat, yellowish, and irregularly marked with black.

When a leech is dry, its skin is hard and rough; on the contrary, in its natural state, it is sleek and soft, owing to the exudation of mucus upon it. The anterior of the two ends of its body, when in a state of contraction, is tapered to a point, and forms the head or oval cap. The posterior end is likewise furnished with a sucker, the anus being placed above it; the rings occupy the space intermediate. Leeches increase in growth in two ways, either by an augmentation of parts already developed, as in other animals, or by the formation of new ones; old leeches therefore have many more rings than young ones.

Temperate climates, or countries in which the heat is not extreme, produce the greatest number of leeches, which are caught in ponds, marshes, and ditches. Those taken from limpid and running streams ought always to be preferred; for alarming symptoms have sometimes followed the application of such as were

few remarks which will complete the practical usefulness of this section. The posterior auricular artery is also sometimes the seat of operation. The patient either lies upon one side; or, when it is practicable, sits up in a low chair, resting his head, bent to one side, upon the chest of an assistant. The place which had better be punctured is situated at an inch above the zygomatic arch of the temporal and malar bones. An incision three or four lines in length, is sufficient for the purpose.

Small aneurismal tumours sometimes appear afterwards at the seat of injury, but will often spontaneously disperse.—*Trans.*

taken from foul waters, in which animal decomposition was going on.

Leeches are kept for use in bottles filled with pure water. The fluid ought frequently to be renewed; twice a week in winter, and in summer every day; neither ought its temperature to be too high, or too low; a heat of about 15 or 20 degrees centigrade best agrees with them. The number of leeches to be put into the bottle must also be proportionate to the quantity of water it will hold; experience has shown that twelve or fifteen of these animals require about a quart of water.

To succeed in the application of leeches we must not be indifferent in their selection. Generally, those of middle size should be chosen, for it is often difficult to make large ones fix, or they will fall off without having produced any effect; on the other hand, the bite of a very small one is not followed by a sufficient discharge of blood. Another criterion in the choice of a leech is the glossiness of its skin, the strength, swiftness, and flexibility of its movements; and it is seldom that other than a satisfactory issue results from the employment of those thus distinguished.

Leeches are applied upon the whole surface of the body. But from certain parts of it, they should sedulously be withheld; such are the known tracks of arteries, veins and nerves of any size. A wound of the superficial temporal artery has been seen by M. Richerand, to follow the bite of a leech, and that of the external jugular vein has been met with by M. Dupuytren. Extreme suffering among patients has been often noticed by a number of practitioners, owing to the lesion of the nerves from a similar cause. Equally to be dreaded is the introduction of one or more leeches into some one of the natural apertures, the nose, mouth, ears, vulva or anus; alarming hæmorrhage may result from such an occurrence. Of this M. Larrey saw an instance in some soldiers, who, in drinking, had swallowed some of these worms. If called to a case of this kind, we should immediately make the patient vomit, or, if this means were not successful, direct him, as advised by M. Double, to drink wine, salt and water, or oxycrate, i. e. water acidulated with vinegar. The occurrence of vomiting would directly cause the expulsion of the leech. There are, however, circumstances under which the introduction of leeches into a natural cavity is proper; but particular precautions are in that case to be taken, of which we shall hereafter speak, and the physician as

well as the patient must keep a watchful eye that the animals do not quit the place upon which it has become necessary to place them.

The effects produced by leeches not being identically similar to those of venæsection, there do occur cases in which no other means can be used as a substitute for them. In the first place, at the moment of inflicting their puncture, they create nervous irritation; this, which arises from injury done to some nervous filaments, is in some irritable persons sufficient to induce slight convulsive movements. In the second place, they sympathetically increase the activity of the general circulation. Thirdly, they solicit by their suction, the afflux of a very considerable quantity of blood into the capillary canals, and thus produce a derivative effect which is felt for many days afterwards.

The cases in which they are used are very numerous. They are generally preferable to bleeding in all inflammations of fibrous and serous tissues, and wherever it exists locally; but, inasmuch as they produce congestion of the capillaries, they ought to be applied around the inflamed parts only, and never upon the seat of inflammation itself.

Leeches take hold always most quickly of the parts upon which the skin is thin, soft and lax; and, on the contrary, do not bite at all upon skin which is rough and dry, or covered with a thick and scaly epidermis. For this reason, the skin ought to be placed in a fit condition for their reception, which is done by shaving it, washing it with tepid water, with or without sugar, to moisten and clean it from impurities, and afterwards rubbing it to produce a determination of blood.*

The Application of Leeches.—There are several ways of effecting this object. If one or two only are to be put on, it is sufficient to hold the leech by its hinder end between the thumb and fore-finger, offering its head to the part upon which we wish it to bite. But it is very difficult in this way to make the leech fasten exactly upon the spot we intend; it generally writhes and essays to get free, or

* To the above mentioned means of making the animal fasten, may be added: 1st. Bathing the part with sweetened milk. 2d. Scratching it with a lancet. 3d. Rubbing it with a piece of raw meat, which is sometimes promptly successful. 4th. Allowing the leeches to crawl upon a linen cloth for a few minutes before they are applied. 5th. In winter, letting them swim a little while in warm water, before hand.—*Trans.*

else applies its oval sucker to the fingers which hold it. A long time often elapses before a single leech can thus be made to fasten; and, in consequence of the pressure which it receives and the fatigue it experiences, its skin dries, it becomes feeble, and rolls itself up into a ball. Several are thus lost unnecessarily, and all the while the affected part is exposed to the cold, which may be attended with serious consequences to the patient. It is therefore, in every case, much better to adopt the following measures, which are particularly suitable when a large number of leeches are to be applied. A number, say six or eight, are collected together in a wine glass, the bottom of which is covered with a piece of paper or a linen rag, to prevent them from sticking; we then turn the glass down upon the skin, on which they soon fasten in a body; the rag should always project beyond the edges of the wine-glass, and, when it is reversed, by pulling on the ends of the linen, the leeches are seen lying upon the skin. The number of leeches applied at a single time varies according to the age and strength of the subject, and to the kind, extent and severity of the inflammation. As many as sixty and even more, are placed upon the abdomen of an adult, in an acute peritonitis. When, on the contrary, a mere local congestion is to be combated, and particularly in children, one or two leeches may suffice. When put on in such small numbers as this, it is sometimes necessary to make the leech fix upon a part situated in a deep cavity, as the gums, tonsils, lining membrane of the eyelids, neck of the uterus, &c. The necessity for circumscribing the point of suction has given rise to the idea of enclosing the leech, with its mouth placed outwardly, in a hollow tube, open at both ends. A needle case, or rolled up card, will answer for this purpose. The cephalic end of the animal is applied upon the spot which is to be relieved; when it has fastened, we set the leech free by pushing on its posterior disk, and drawing off the sheath. Loefler's instrument is constructed upon this principle. Bruninghausen has contrived a similar one, which consists of a glass tube, in which the leech is enclosed, and from which it is expelled by a piston. MM. Brewer and Delaroche caused a hole to be made through the piston, so as to allow of the passage of air. It may be enquired, what advantage is derived from this modification; but to the inventor of the new instrument called the *leech-fixer* (*pose-sangsues,*) at least, it has not appeared unimportant.

This very simple instrument perfectly succeeds in attaining the end for which it is designed. It is composed of a small capsule of silver wire, of semi-oval shape, and looking very much like the little vessels in which the eyelids are immersed in opthalmia. The free edge is convex in the direction of its greatest diameter, and is made of silver wire so flattened as to be capable of accurate application upon the skin. The top ends by a ring which assists in pressing upon the instrument. The capacity of the semi-oval is sufficient to contain within it six or eight leeches. Directly that the leech-fixer has been turned down, the leeches fasten upon the skin, the weak and strong alike without any exception; and in a very few moments, thirty or forty leeches may be made to take hold upon the very spot at which we desire them to be applied.

On contemplating a result so remarkable, the question, to what is it owing, naturally arises. Is it to the introduction of air through the metallic gauze, or to some galvanic agency exercised by the silver itself; or lastly, do not these two causes conjointly contribute to effect it? The interesting experiments of M. Vernière upon the exquisite sensibility of leeches, which is such, that they are vividly affected by water which contains only the one millionth part of its weight of nitrate of silver, would seem to give colour to the belief that to galvanism is in a measure owing the unwonted activity which these creatures display beneath the instrument of which we are speaking, Be this as it may, and viewing it only as it respects its therapeutical value, the leech-fixer is a very convenient instrument; it saves the patient from all the unpleasantness or danger which there is in the too slow application of the leeches, such as a cramped or painful position, exposure to cold, &c., continued for a long while; and it does away with the necessity of the surgeon himself performing this trifling duty, as any person wholly unacquainted with the art, provided with this instrument, may effect it with ease. But, in order to make his invention available in every case, the discoverer should construct some of Loefler's tubes out of the silver wire; which analogy leads us to suppose would be attended with equally happy results; and leeches might then be made to fasten upon the depth of a cavity, with as much ease and safety as upon a smooth and free surface.

The mouth of a leech is of a triangular shape and has three little jaws, or semilunar teeth. These teeth are nothing else than papillæ, armed, according to Dom Allou, with two rows of sixty denticuli

each; which, for the three jaws, will make the whole number of little teeth three hundred and sixty. The leech, when it is about to bite, protrudes the semilunar bodies in which the denticuli are, and rounds its head into a disk which it applies flatly upon the skin, making a vacuum by suction. These motions are produced by muscles which are attached to the jaws and œsophagus, and by an orbicular one which appertains to the oral sucker. The bite lasts for several minutes, and produces itching, and sometimes very acute pain. A vermicular motion of the leech, by which the rings of its body, from its head to the sucker at its tail are contracted, announces the commencement of its action. This does not generally go further than the rete mucosum; though it is not uncommon for it to penetrate quite through the cutis. In half or three quarters of an hour, the animals have swallowed as much blood as they are capable of containing; they then fall off of themselves, leaving as many triangular orifices which continue to bleed after their removal. When, of a great number of leeches which have been applied, a very few only still adhere, it is better to take them off, for they can produce no further effect, and, by remaining suspended by their suckers, they painfully pull upon the seat of injury. This advice will be yet more judicious, when the patient has assumed an inconvenient posture, or there is danger from exposing the part to the cold air. But, leeches to be removed, must not be torn away, as that might cause the laceration of the small wounds, and subsequently their suppuration; there is a much more simple way, which makes them easily let go; it is to sprinkle upon their heads and backs a little salt, snuff, or lunar caustic, or to pour upon them a little of any irritating solution whatever.

The quantity detracted by each leech, has been estimated at two or three drachms. This approximation is very near the truth, inasmuch as it includes both the blood swallowed by the worm, and that which afterwards escapes from its puncture. It is the opinion of M. Moquin Tandon, that a leech is capable of drawing a quantity of blood which is equal in weight to its own. This assertion has been modified by M. Vernière. According to his experiments, the hirudo officinalis of the smallest size absorbs twice and a half its own weight or fifty grains; a middle sized one, twice its weight or eighty grains; and lastly, the largest sized leech absorbs its own weight or eighty grains; the medium term of these measurements

giving seventy grains, or about a drachm of blood drawn in by every leech during the period of its suction.

The quantity of fluid furnished by the bites after the fall of the leeches has also been made the subject of calculation. Some of these wounds bleed for so long a time and in such abundance, that we are obliged to arrest the hæmorrhage; others again, yield not more than a few drops of blood. In order to estimate the average quantity, the fairest way would be to consider each wound as affording a discharge of blood which is one and a half times the quantity absorbed by the animal itself, or a drachm and a half. Adding this sum to the other, two drachms and a half will represent the weight of blood obtained by every leech, which for every three would be about one ounce. Whence it appears, that to abstract a quantity of blood equal to a venæsection amounting to three *pallettes*, we must apply twenty five or thirty leeches to the patient.

We have entered minutely into the details connected with this subject, because the conclusions at which we have thus arrived, are highly important in practice, and to all practitioners not equally familiar. In the foregoing calculation, we have gone upon the principle that the leeches were applied to adults from twenty-five to forty years of age. It is but proper to observe, that the case in children and old persons may be otherwise. In the former, owing to the delicacy of their skin and the energy of their capillary circulation, the application of leeches is attended with a more abundant evacuation than the quantity above stated. The opposite condition in the old is productive of contrary results. Young women are, in this respect, more like children; and of all these circumstances the surgeon should be aware and mindful. It must have appeared, that in the use of leeches, care, prudence, judgment and correct knowledge are needed to arrive at an anticipated result. We do not allude to the numerous cases in which, failing in their application owing to particular states of the atmosphere, badness of quality, or carelessness in their management, they completely deceive the hopes of the physician, frustrate his endeavours, and often, under emergencies, cause him to waste in fruitless trials, time which is precious to the patient. But, as these mishaps are often encountered in practice, and particularly in the country, we should, in urgent cases, if the leeches obtained are not sufficiently active, some out of the number fixing with difficulty, and others not fastening at all, either at once change them for others; or when that is not practicable, decide immediately

upon cups, bleeding, or some other measure which will equally fulfil the necessary indication.

The blood very often continues to flow in a sheet for several hours, after the leeches have fallen off. This is a necessary evacuation, and produces frequently happier results than that which took place during their suction. When it does not issue in sufficient quantity, its flow is facilitated as well as solicited by washing the bites with warm water, by laying over them an emollient poultice, or by exposing them to steam at 50° cent.* If these means prove insufficient, the cupping pump should be applied, emptying it as fast as it fills, until the requisite quantity of blood has been obtained. In the event of the leeches being put upon a very extended surface, instead of one cup it is better to apply several, exhausting them all with the same pump. The duration of the process is in this way curtailed, and what is still better, the disengorgement of several bites is effected at once.

But if it happens, under some circumstances, that leech-bites do not furnish a sufficient quantity of blood, so on the other hand, it often flows too long, and the debility of the patient obliges us to arrest it. This is done by cold lotions; astringents or styptics; and by stopping the wound with spunk, as it is, or dusted with pounce powder. Should these not succeed, we must have recourse to cauterization with sulphate of copper, calcined alum or the nitrate of silver. But there is another means which seldom fails, and has not the disadvantage of causing an eschar; it is, to lay upon the bites a compress folded several times, over which a spatula or a silver spoon highly heated is passed several times. The linen imbibes the serum of the blood, and the rapid evaporation of that fluid quickly produces coagula which prevent the hæmorrhage from proceeding.†

* Dr. Marshall Hall (on loss of blood) advises great caution to be exercised in covering up parts on which leech bites are bleeding, in warm poultices under the bed-clothes, as there sometimes issues a quantity of blood from them scarcely suspected. "I have known," says he, "the patient inundated by the blood thus flowing from a dozen leech bites on the abdomen, and affected with the most fearful symptoms of exhaustion."—*Trans.*

† To the above means may be added the application of hat fur, lint, fine flour, or tartar emetic in powder over the punctures. The introduction into the bite of a knitting needle heated to whiteness, or of a piece of lunar caustic sharpened to a point will almost instantly succeed. Although even this will seldom be needed, it must not be forgotten that fatal cases of this hæmorrhage, in children particularly, who cannot make known their sensations, have occurred in spite of every exertion to restrain it.—*Trans.*

As soon as the blood has ceased to flow, there occurs in the part on which the leeches have been placed, and above the neighbouring integuments, a projection caused by the congested state of the capillary vessels. Each triangular bite is in the centre of a small rounded tumour, of a deep violet hue; it itches most unpleasantly for several days, and involves the neighbouring parts more or less in its own irritation. By the continuance of this pruritus and the capillary engorgement, the derivative or revulsive effect of the leeching is for a long time maintained, and in this respect, they singularly increase its therapeutic result. In serious cases, in which it is thought necessary to continue the irritation, a blister is laid over the seat of the leeching. This, when it is employed as a remedy for certain cerebral, thoracic, or abdominal affections tending to become chronic, is generally either the nape of the neck or the epigastrium. In ordinary cases, the sensation of itching, when distressing to the patient, may be allayed by merely the application of anodyne and emollient poultices. But, if in this condition, the patient irritates the bites by scratching them; if the part is exposed to the frictions of a woollen garment, stockings, or a flannel waistcoat, or if the person gives way to great bodily restlessness, these wounds inflame, suppurate, and an enlargement of the lymphatic ganglia to which the absorbents of the part extend often occurs. This accident is common in the groins and armpits, after the application of leeches either to the lower or upper extremities, or the parietes of the chest. If not taken in time it may go on to form an abscess. Another very frequent cause of inflammation of the punctures and absorbents is the stasis of blood in the congested capillary vessels, when, owing to the leeches having only pierced the skin, and not drawn much blood, the wounds, after their fall, instead of discharging, continue dry and highly irritated.

When no accident is about to occur, a violet areola encircles the punctures for several days, and the surrounding parts have a yellowish tinge; these colours disappear gradually upon the absorption of the effused blood, and afterwards a cicatrix forms on every bite, which is red for a long time, but subsequently becomes white, and forms a little tubercle which never again disappears. But if the wounds have suppurated from excessive irritation, it is often no easy thing to make them cicatrize; from some there arise fungi, others are excavated by ulceration, and in those which have pierced the derma, small fistulæ are established. The fungi are to be ex-

cised and cauterized by means of the nitrate of silver, and the ulcers and fistulæ treated by caustic alone, when the cicatrix will not be long in forming.*

Other occurrences also result from the application of leeches; such are ecchymoses from perforation of the derma, erysipelas, phlegmon, abscesses either from the irritation of the bites or sanguineous infiltration, wounds of arteries, veins nerves, &c. Of these eventual diseases we can only take this passing notice; this is not the place to enter upon their consideration. We take our leave of the subject, with the mention of an occurrence which more particularly belongs to the matter of our article; the event of the passage of one or several leeches into the nose, rectum, or vagina, and the expulsion of which it would be necessary to effect with all speed. The injection of tobacco, in fumes or infusion, has here been recommended; but as this is not free from danger, from the narcotism produced by its introduction, other enemata, of wine, oxycrate, hydro-chlorate of soda and nitre, &c., should be preferred.

OF CUPPING.†

The application of cups is intended to produce an afflux of fluids to a part, by withdrawing it more or less completely from the pressure of the atmosphere, by means of the vacuum. The cup consists of a bell glass, two to four inches high, and of about an equal diameter; its orifice forms a smooth, flat and circular edge, which may be laid evenly upon the skin without doing it any injury. By the use of this instrument two objects are aimed at. Either we wish to produce a mere engorgement of the cellular tissue with rubefaction of the integuments; in which case, the cup is an agent of derivation or revulsion, and the process is called *dry cupping;* or else, we detract blood, by means of superficial incisions into the skin; in which event the cup acts like a leech, the process being called *scarified cupping.*

* Leech bites in persons of vitiated habits of body, or exhausted systems, have been known to become gangrenous, and the cases have ended in death. —*Trans.*

† Local bleeding, upon the consideration of which the author has already entered, may be regarded in three lights: First, as an auxiliary to general bleeding; secondly, as proper in cases in which general bleeding cannot be borne; thirdly, as called for in cases in which exhaustion with reaction, requires the loss of more blood, which if detracted in any other way would be

Dry cupping is performed in two ways, in one of which the cup is applied alone, and in the other it is surmounted by a suction pump. In the simple cup, the vacuum is produced by the rarefaction of the contained air. In performing the operation, we require to be provided with a lighted candle, some cotton balls, dissecting forceps, and a vessel holding some rectified spirits of wine. The operator then takes the cup in his right hand, its mouth being upwards, and first heats it over the candle to dilate the air within; then he takes hold with the forceps of one of the cotton balls, dips it in the alcohol, and sets fire to it. This burning ball he throws into the bell glass, the air in which it rarefies by its heat, and by depriving it of oxygen for the support of its combustion; he then applies the edges of the cup evenly upon the skin, previously protected by a card to prevent its being burned. As the glass cools, the condensation of the air and alcoholic vapour is soon effected. The integuments, pressed upon by the external weight of the atmosphere, which is much greater than that within, rise up into the cavity of the glass; and the fluids, solicited from the adjacent capillary vessels in the same direction, flow to the skin, redden and tumefy it. When this effect is produced, the cup is easily detached by leaning it over a little, and with the finger pressing upon the skin on the highest side. If necessary, the operation is to be repeated. Instead of cotton balls, we may use tow, or paper, &c. steeped in the same way in alcohol. This is the way in which cups are generally applied, but it is liable to numerous objections; the combustible substance often burns badly; at other times it overheats the glass, or

injurious or fatal. Leeches, and scarification by cups or otherwise, are the means of effecting it. There are but few cases or places, in which cups may be applied, to which leeching is not equally applicable; but there are many parts upon which cups cannot be put at all. However, leeches are unfortunately much the more expensive method of the two. The same effects upon the system at large are produced by local as by general bleeding; such as syncope, convulsions, coma, exhaustion, &c., and even death itself; but not with equal speed or certainty. Hence, though comparatively uninjurious, care and caution are demanded in its use; in children more particularly, as they are often the subjects of it. It was the opinion of Dr. Armstrong "that detraction of small portions of blood from the capillaries by leeches, had a powerful effect in lessening the action of the heart; when considerably more would have been required to produce it, if taken from a large vessel."—*Trans.*

burns the skin; and the vacuum is always incomplete. All these inconveniences may be obviated by adopting the following plan.*

Cupping Glasses and Pump.—This produces the same therapeutical effects as the simple bell glass, but in a more speedy, certain, and above all a more convenient way. The glass used is in size and shape the same as that already described, except that it has upon its top a copper tube or neck which is closed and opened by a stop-cock. Above the tube a pump body may be screwed on or unscrewed at pleasure, and being a separate part, it may be adapted to several glasses successively. The pump is a mere hollow cylinder, with a movable piston in its centre, which by a prolongation at its lower end, adapts itself to the tube of the bell glass; its capacity is about equal to that of the cup. Nothing can be more simple than the use of this very ingenious instrument. The free circular edge of the cupping glass is besmeared with some solid fatty matter, to facilitate its adhesion, and it is applied evenly to the skin; we next screw the pump upon the tube; then turn the stop-cock, and by raising the piston the dilatation of the air in the cup, produced by the inhalation of a quantity into the barrel of the pump, causes the skin to puff up into the cavity of the glass in a degree equal to the diminution of pressure within.

Such are the two ways in which *dry cupping* is commonly practised. The only difference between *scarified cupping* and the pre-

* All these inconveniences are obviated by the plan pursued in this city, where it is customary to use cups of tin, nearly cylindrical, but narrowest at their mouths, and about three inches high. They are first placed in a basin of hot water. The operator, having either a lighted candle, or piece of paper which had been dipped in alcohol and ignited, in his left hand, takes out the cups successively with his right hand, holds them over the flame for a few seconds, then quickly applies them on the skin, at the spot selected. By this primary dry cupping the parts become engorged, previously to the application of the scarificator. Each cup is then removed, and the scarificator discharged over its seat. The cups are now again exhausted as before, placed over the incisions, removed, washed and reapplied as often as is necessary. If a large detraction of blood is needed, the scarificator is replaced over the former incisions at right angles to them, and new ones are effected which intersect the old; but this process is painful. Each time that a cup is taken off, we should wipe the wound with a soft sponge, dipped in warm water. To take off a cup dexterously and cleanly, we are advised to insert the outer surface of the nail of the fore finger under its uppermost edge, to allow of the entrance of air into its cavity; then to turn it quickly down and remove it.—*Trans.*

ceding one, consists in the incisions previously practised upon the skin. They should not be made deeper than half a line, and several instruments, the bistoury, the lancet, the razor and the scarificator may be chosen for that purpose. To the latter (of which a description will be found in the chapter on punctures and scarifications) it is very uncommon to resort. The scarifications should be executed very rapidly, to the extent of two or three inches, by drawing the edge of the lancet or bistoury flatwise upon the part. The bistoury (scalpel) is the better instrument. When lowered parallel to the surface of the skin, the scarification, from the blade cutting in its whole length at the same time, is made immediately and as soon as the edge has been moved a very few lines, whilst for the action of the lancet a much longer time is required, the limited extent of its cutting surface causing it, as it were, to cut only one part at a time, which uselessly prolongs the pain of the operation. In pursuing the scarification, parallel lines are formed, about half an inch apart, and their direction is again crossed by other lines, which intersect the former obliquely or at a right angle, so as to form either squares or lozenges in the interspaces.

The blood, in whatever way the incisions may have been produced, springs up into the cavity of the bell glass, when it is placed over them. But the heat of that fluid rarefying the air within, and its vapour filling up the space, and reacting by its elastic tension, the equilibrium of pressure is soon re-established, and the cup falls off. Here it is that the superiority of the cupping pump shows itself, in allowing of our reproducing the vacuum, and, by repeated suctions, as the pressure is taken off, again filling the cup with blood.

The cupping pump, with scarifications, is highly advantageous in the performance of capillary blood letting; and the analogy of its modus agendi with that of leeches, allows of our substituting it for them in every country and at every season: for, notwithstanding the advantages which they afford, cupping is not liable to the same objections, such as scarcity, badness of quality, and faithlessness in their employment.*

* With the concluding paragraph of this section, the translators can but in part only agree. They do not believe that cupping can, under *every* circumstance, be substituted for leeching; nor do they think the substitution here spoken of is likely to be made. Cupping, be it practised as it may, is a harsh and often painful operation; upon inflamed and tender parts it is often

OF THE BDELLOMETER.

The instrument to which the above name has been assigned by M. Sarlandière is merely a modification of the cupping pump. It was simultaneously invented by both M. Sarlandière and M. Demours.

The chief object of the instrument is to effect the scarifications in vacuo, whereby they are done with less pain and greater rapidity: but this advantage is counterbalanced by a less degree of solidity.

It differs but little from the cupping pump. The bell glass is more extensive; perhaps it is even too much so, for it can only be applied to plane surfaces of certain extent. It has in its bell two orifices; that at the top receives a neck of copper, in which moves roughly a metallic rod. Inside the glass, this rod is fastened upon a disk armed with a certain number of lancet blades which pass through the holes in a kind of a movable grating. The intention of this grating is to control the protrusion of the lancets, and consequently to limit the depth to which they can penetrate. On the side of the glass is another opening similar to that in the pump cupping

inadmissible; upon delicate infants, impracticable; as it regards the detraction of blood, inconsiderable. As a counter-irritant, it probably possesses but little superiority. The puncture of a leech is momentarily painful, and subsides; it is every where applicable; the infant endures it without complaint. But we have known the robust adult flinch from a second cupping; it is tedious, and requires frequent repetition of the same suffering at one operation. To many parts, again, cups cannot be applied at all, as to the eyelids, nose, fingers, penis, scrotum, anus and vulva; cups cannot, therefore, under most circumstances, be substituted for leeches; although a few occasions may occur in which they may be preferable. When speedy action is desirable, as in apoplexy, cups may be the most sure; but to such perfection is the management of leeches now brought, that scarcity is no longer felt, and a bad leech is nearly as uncommon as an imperfect cupping apparatus. Thirty leeches at least, affording about ten ounces of blood, may be applied within the circumference occupied by a single cup, which would with difficulty furnish one-fifth of that quantity. Whenever leeches can be obtained, we are sure that they will generally receive the preference in a majority of diseases, and among patients who can afford them; whilst he who practises among the poor, or who has nothing but cups to depend on, will often most earnestly lamen this deficiency. In chronic rheumatisms of the limbs, or to the spine, in neuralgia of the sentient extremities of the spinal nerves, &c., cupping is invaluable; whilst from the lower charge for performing it, it is the most generally accessible means of local blood letting.—*Trans.*

glass, and intended for the same purpose, viz.: to exhaust the interior of the bell. M. Sarlandière adapted to the lower part of the glass, a third neck with a stop-cock, which gives exit to the blood accumulated within.

In using the bdellometer, it is applied flatwise like other cups. The vacuum is effected by the pump adapted to the lateral neck; and when the integuments protrude into the cavity of the bell, we press upon the button which sets the scarificator in motion, and the lancets pass into the skin; directly upon which, the blood gushes into the interior of the cup. There appears to be no great usefulness in the third neck; if it so happen that the blood coagulates, instead of its flowing out of the stop-cock, the air will flow in; and lastly, it is easier as well as more favorable to the emission of a fresh quantity, to take off the bell, empty it, and having cleansed the incisions, to reapply it.

Such is the bdellometer, and that it is capable of proving beneficial no one can deny; but its superiority to the cupping pump with scarifications is not apparent. It has the common fault of all complicated instruments, that of being more difficult of application, and less certain in its results. The stem of the scarificator either moves too hard, or slips too freely in the leather box. In the first case it is not easy to govern the depth of the incision; in the second, air will insinuate itself into the bell glass, and tend to re-establish the equilibrium of pressure. Lastly, its somewhat high price does not place it equally within the reach of every practitioner.

The cupping pump, on the contrary, less costly, more portable, and of less complicated construction, is not likely to get out of order, and is capable of producing similar effects; not in so short a time it is true, for the scarification must have been performed previously to its application. Like the bdellometer, it allows of a re-establishment of the vacuum within the glass, and for certain uses is almost exclusively proper, such as being applied over the bites of leeches to increase the discharge from them, and upon poisoned wounds in the way recommended by Dr. Barry, to draw out their fluid contents, and prevent them from being absorbed by the veins. We do not look upon this step as the best that can be taken under these circumstances; but it may at least serve as a temporary resource, and either lessen or postpone the danger, when having no other means at our disposal, we are obliged to await the arrival of caustic or cautery irons. Another more ingenious application of the cupping

pump, which daily performs the most beneficial services, is that which is made to the mammæ of females who are prevented from nursing, and in whom the breasts are congested and tumefied.* The exhaustion of the pump produces an artificial lactation, which may be urged so far as to relieve the breasts, and repeated as often as is required. Upon the whole, the cupping pump really seems to us so indispensable under very many circumstances, and so decidedly superior to the mere bell even for producing dry cupping, that we do not hesitate to consider the instrument as one of those which every surgeon ought always to possess.

Whatever be the means adopted for the application of cups, the therapeutical agency which they exercise is easily understood.

Dry cupping, by producing local congestion, acts as a derivative or revulsive means, according as the seat of its application is nearer to, or further from that whence the irritation is to be diverted. Scarified cupping, if it yields but little blood, can but increase the revulsive action, by the addition of intense pain to capillary congestion. Either way creates more or less local inflammation; although dry cupping is but seldom followed by it, unless very much prolonged. Now that we are in possession of the cupping pump and the bdellometer, we can procure besides the derivative or revulsive action, a sanguineous evacuation, which will compare with that obtained from phlebotomy and the use of leeches; and as to the latter, we are enabled to augment very much the quantity which they can furnish, and thus produce speedy and certain effects at pleasure.

We determine the spot for placing our cups according to the seat and nature of the disease, and to the effect which we expect them to produce. As agents of derivation, we place them on the walls of the splanchnic cavities, opposite the oppressed organ we desire to unload, or upon the surface of an inflamed joint; when our object is to recall a secretion thither, to create an inflammation, or to prevent absorption from taking place, as mentioned in speaking of Dr. Barry's

* For this purpose an instrument upon the same prineiple has been invented, called the breast-pump. It is of easier adaptation to the breast, from not having the narrow edge of the cupping glass, but a broad one laterally, and concave that it may adapt itself to the convexity of the mammæ. A less expensive apparatus than the latter, for the same end, is made of a glass of a like shape, with a long gum elastic tube attached to a brass neck at the top, and known by the name of Breast-pipe. The great objection to both these articles, but particularly the former, is their excessive power.—*Trans.*

plan, we apply our cups upon the very seat of the affection itself. As agents of revulsion they are placed at a greater or less distance from the part diseased, where, for instance an hæmorrhage is to be checked or a congestion diverted, by which some important viscus is threatened with injury. Finally, as evacuants, cups, which should be preceded by scarification, fulfil nearly the same indications which leeches do.

But to produce such diverse effects at pleasure, under all circumstances, we ought to be able to apply cups to each and every surface without distinction. Now, with the scarcely varying dimensions universally given to the instruments, a plane surface of some inches in extent is required to receive them, which puts it out of our power to use them upon the head, around a number of joints, and upon thin persons, particularly where projecting bones produce inequalities of surface. It would be easy to do away this inconvenience by contracting the free edges of the bells which are applied upon the skin, in different degrees, and by surrounding the outer circumference with some such material as caoutchouc, the elasticity of which, when placed upon a curved or unequal surface, allows the different points in the circle of the rim to be compressed or not, without, at the same time relaxing their adhesion to the skin, or in other words, without allowing the air to enter the cavity of the cupping glass. The general usefulness of cups would in this way be rendered vastly more extensive, nor should we then be, as we are now, obliged to abandon their application in cases in which they were called for, merely because the surfaces upon which they are required to be put are not suited to their adaptation.

OF INCISIONS.

Every solution of continuity effected in a soft part by means of a cutting instrument is, in anatomy and in pathology, called an Incision. It is, owing to the constant use made of it in surgery, and to the varying forms which it assumes, of all simple operations, that with which we should be most familiar, and in which we should most excel. It is, in itself, the perfecter of a multitude of little operations, such as punctures, dissections, excisions, resections and the like; and it enters moreover as an element into the great surgical operations, one so absolutely indispensable, that the latter are in a great measure composed of a series of incisions varying in form, direction, extent, in the nature of the parts

they injure, and the kind of instrument with which they are inflicted.

In every instrument to which one has been given, the cutting edge is the summit of the angle, more or less acute, which results from the junction of two plane surfaces. It is seen, when subjected to the microscope, to consist of an innumerable series of small teeth, which proves that cutting instruments are, in fact, merely saws of extreme delicacy; in proportion as these teeth are numerous and sharp, in other words, the better the setting of the instrument, the better it will cut.

Two sorts of motions are requisite for the performance of an incision; the one is perpendicular, and the other parallel to the surfaces to be incised; the first presses, and the latter saws. So very different is the mode of acting of either force, that if we do no more than lay a sharp edge upon a part and make slow pressure, the tissues will first be crowded back and form a furrow beneath the edge which compresses them, before they suffer themselves to be penetrated by it. But if, after an almost imperceptible pressure, we draw the instrument in a parallel direction, they will be instantly divided. The art of incising consists in knowing how to graduate these two kinds of motions according to the shape and weight of the instrument we use. Not less influence upon the neatness and quickness with which incisions are performed, is exercised by the consistence and elasticity of the tissues; and thus the same instrument urged with very feeble power will instantly divide tissues which are resisting and firm, whilst a much greater force will be needed to incise flabby parts which yield before the edge of the knife. By practice alone can that certainty of hand be acquired, by which a surgeon, skilful in graduating his pressure, cuts neither too deeply, nor not sufficiently deep.

Bistouries and scissors are used in the making of incisions.

The bistoury is a kind of knife, having a blade about three inches in length, which is received into a handle. The manner of joining these two parts has been much varied. In some bistouries the blade is riveted and immovable. Instruments of this construction are very solid, but not portable, and they enter as components of the amputating case. For general use, those which open or shut at pleasure, are preferred. Among them, the most common are those which are only hinge-jointed; the heel of the blade ends in a little flat button, which, when the instrument is open, will not pass

from behind forwards between the two surfaces which compose the handle; but although the back is thus prevented from being reversed, there is nothing to prevent the blade from closing during an operation, contrary to the wish of the surgeon. This very common objection, which has led to accidents, has caused this kind of bistoury to be now laid aside. The better kind are those which may be fixed at will; but all the means adopted do not answer this end with equal fidelity. In some, it was thought to have been attained by a sort of silver ring or ferule which surrounds the handle, which is made of equal width throughout, and which ring is slid up over the heel of the blade. The bistoury is kept open so long as the ring keeps this position; but, owing to the motions of the fingers it is often displaced, slips, the blade vacillates in the handle, and the double risk is incurred of cutting our patients and ourselves. Two methods of articulation only are nearly free from imperfections; in the first, the blade is fastened to the handle by a spring like that which nearly all cutlers employ for keeping open the blade of a pocket-knife. The second is marked by mechanism of a more novel kind. The pivot of the hinge is flattened from behind forwards, and offers consequently its largest diameter parallel to the length of the handle. Again, the round hole in the heel of the blade, in which the pivot is received, extends towards the point in the form of a longitudinal slit. If we suppose the instrument to be open, the blade and handle being upon the same line, by pressing the two parts of the instrument against each other as if to make them penetrate, the pivot enters the long slit in the heel and the bistoury is steadily fixed.

The shape of the blade of the bistoury gives to it the name which it bears. The principal kinds are the simply straight bistoury, the straight probe-pointed, the convex and the concave.

In the *straight bistoury*, the edge and the back, as they leave the heel unite in an acute angle at the end of the blade, after describing a gentle curve; the best size for the blade is two inches and a third in length, and four lines or four lines and a quarter in its greatest width. The cutting edge of a well made instrument should be so constructed, as when placed on a flat surface, to touch at its belly or largest part; its point should rise for about two lines, and that part of the blade which is nearest the heel, about the third of that distance; the point should be very acute, and the blade perfectly sloping. The straight bistoury is constantly employed in all sorts of operations;

for punctures, abscesses, tying of arteries, excisions, &c., it is almost the only one used. Every person ought always to have several of them in his possession. The instrument has been objected to by M. Percy, as not being suitable for making incisions, owing to its point sloping badly and not cutting as well as the rest of the blade, but habit corrects this imperfection, and it is a very superior one to any other for cutting tissues and for making incisions of equal depth in every part.

The blade of the straight probe-pointed bistoury is but two lines and a half wide near the heel, and a line and a quarter towards its other extremity which ends in a button. Every time that a frenum or stricture is to be divided in a deep cavity, this instrument is indispensable; the point of a common straight bistoury might, as in hernia, injure parts or vessels which it were important to preserve.

The bistoury (*scalpel*) which is convex upon its cutting edge, has the same dimensions as the straight bistoury; except that the width of its blade continues for nearly three fourths of its length. Here, the cutting edge is rounded off to form a point with the back, which is straight; so that the convexity begins at nine lines from the point, and describes the whole width of the instrument. It is used in extirpating bulky tumours, and for cutting flatwise; moreover, it may be substituted for the straight bistoury under all circumstances in which the first incision is not begun by a puncture.

The concave edged bistoury is appropriated for the section of frena at great depths, particularly in the operation for hernia, to divide the stricture. Convex bistouries are likewise used for similar purposes. Both are curved in the whole length of the blade, are narrow that they may be more easily insinuated, and probe-pointed that they may not do injury to parts. Beside which, as their action can bear only upon the very limited point which causes the strangulation, a small portion only of their blade is furnished with a cutting edge, and that near the probe-end. With a like view of preserving the viscera, M. Chaumas has recently conceived the idea of terminating the back of the instrument by a small metallic plate, which reminds one of the winged catheter of Méry.*

* The French apply the term *bistoury* indiscriminately to either of the three species of surgical knives, for which *we* have distinct names. The loose handled instruments mentioned by the author are seldom used by English or American surgeons. In all large operations the incisions are effected with

Incisions differ from one another. First, *as it regards their extent.* This must be proportionate to the nature of the case by which it is required. The smaller ones are little more than punctures, such as the orifice in bleeding and for opening an abscess. Large incisions are necessary in cutting away frena, and in extirpating large tumours; they compose, besides, a part of the method of performing many operations.

Secondly, *in their depth.* This varies according to the end proposed. The more superficial merely involve the epidermis and rete mucosum, such as the scarifications in cupping. Very deep incisions are called gashes. They are demanded most frequently in sub-aponeurotic abscesses, in the extirpation of cysts, in the extraction of exfoliations, splinters, projectiles, &c. We shall mention, when speaking of the *seats* of incisions, the care required in making deep gashes, according to the tissues which they involve.

Thirdly, *in their direction.* The direction, considered in reference to the incised surface, ought to be so calculated as that the fluids which the wound will secrete may easily find an exit; and in cutting tissues across, we must disorder them as little as possible. It is better, for instance, to separate muscles than to divide them; but if, to cut them is unavoidable, an incision parallel to their fibres is preferable to one which would divide them more or less obliquely, or crosswise particularly. The direction, as it respects their depth, is a point of no less importance than that which

the *scalpel*, a solid handled, straight, convex knife, sometimes with double edges; about six inches long, although of different sizes, some very small. They are put up in numbers, 5, 6, 8, or more, in neat rosewood or mahogany cases, together with aneurism needles, tenacula, double hooks, dissecting and artery forceps, &c. The scalpel corresponds in shape and purpose with the author's "bistoury, convex on the cutting side." Another convenient application of it is in amputations of the toes and fingers. Next, we have instruments longer than scalpels, with bistoury blades fixed in the handles, which also find a place in surgeons' cases; they are straight, probe-pointed, curved, convex or concave; and are used in herniæ, fistulæ, division of the facial nerves for neuralgia, in lithotomy, &c. Thirdly, come our *bistouries*, properly so called, of the same shapes as those just named, but movable in their handles, and portable. They are usually met with in the *pocket* case, and serve for trifling or extemporaneous operations. They should be made with handles such as the author describes as being possessed by French instruments, for greater security, and will then not differ from them, nor the solid handled bistoury used by us.—*Trans.*

is parallel to the surface. When all that is required is to go down deep, and no danger from introduction of air is to be apprehended, the incision should take the shortest way, that is, go perpendicularly to the surface. But if, on the contrary, we would avoid all outward communication of the cavity of an abscess after its evacuation, as in puncturing an abscess from congestion, or in that of empyema, our incision should pass obliquely, that the parellelism between the tissues concerned may thereby, after the operation, be destroyed.

Fourthly, *the seats of incisions.* We ought as much as possible, to make our incisions at a distance from places abundantly supplied with vessels and nerves; such as the groins, armpits, verge of the anus; or from those which lie, like the walls of the chest and abdomen, in front of parts of very great importance. When, as in cases of herniæ, an operation upon these parts cannot be avoided, it is better to return several times to the incision, and lay bare each superincumbent tissue in succession, than at once to go deeply down, and thereby to run the risk of inflicting serious or fatal injury. Another consideration appertaining to the situation of an incision, not indeed of equal importance, but still of frequent application to cases which occur, is that which relates to the disfigurement of cicatrices upon parts exposed to the air. Taking an operation on the face, for example, not only should we give the incision no more extent than is absolutely necessary, but we should, as far as in us lies, perform it on the least prominent spot, and particularly at the bottom of a wrinkle, which might afterwards conceal the scar.

An old classification of incisions is that which has reference to the divided parts, whether made from the surface towards the depth, or inversely, that is from without inwards, or from within outwards; as it regards the direction which the hand of the operator follows, they are likewise distinguished as incisions made from right to left, from left to right, from the surgeon and towards him. In any of these ways of operating we use the bistoury, either alone or upon a director.*

RULES FOR INCISIONS.

The proper performance of these operations requires submission

* We shall continue the use of this word, for which *scalpel* may throughout be substituted.—*Trans.*

to certain essential rules, which we shall now detail. The surgeon, having in his hand a suitable instrument, is to dip it in oil, to facilitate its passage through the muscles without the infliction of as much pain. Instead of this procedure, which is the invention of a surgeon at Heidelberg, M. Richerand prefers the use of warm water, in which the instrument is to be immersed. By this process, the little teeth which form the cutting edge, are dilated by the heat, made sharper, and insinuate themselves more easily into the parts. Either of these means facilitates the section, but by the heat of the blade, the second may add to the pain; and as this objection seems to us irremediable, we should give a preference to the oleaginous inunction.

Before we incise, the parts should be stretched in a direction opposed to the course of the instrument. But for this precaution, as we have before seen, the flaccid tissues give way before it, and form furrows or wrinkles in front of its edge; and if we try to obviate this by increased pressure, we run a risk of going much deeper than is proper.

The harshness and dryness of the skin has no less influence over the pressure to be employed than the resistance of the subjacent tissues. The delicate skin of children, women, and lymphatic and sanguineous individuals, cuts much easier than that of thin, bilious and hypocondriacal adults, or than that of old people. Lastly, in the same person the quality of the integuments differs in different places, from the excessive delicacy of that which covers the anterior part of the neck, to the almost horny hardness of the cuticular covering of the heel. The surgeon, in using the bistoury, should bear these circumstances in mind, that he may regulate both the tension of the parts, and the degree of pressure with which his instrument is to incise them.

We offer the edge lying upon the parts and perpendicular to their surface: in this way, we avoid cutting the integuments with a slant, which would augment the pain and retard cicatrization; but, besides this, by drawing the bistoury along in the position just described, we penetrate to a like depth in every part, and thus if necessary, escape arteries, nerves, tendons, and even muscles, which generally pursue a similar direction to that of the cutaneous envelope.

The first stroke of the bistoury should describe the entire length of extent which is intended to be given to the incision. We may

go deeply down also at this first motion, if there be no danger to be apprehended from penetrating directly to the spot we design to reach. The quickness which results from operating in this way, is a saving to the patient of a great deal of useless pain.

However, under a great many circumstances, it is much more prudent to cut layer after layer; but even in these cases, the skin should be completely divided from one angle of the wound to the other, at a stroke, for we should guard against making incomplete sections, which are vulgarly called *tails;* if they do not interfere with the cure, they inflict unnecessary pain, and lay the surgeon open to censure for want of ability.

Lastly, it is a thing of the utmost importance that the instrument should be always and entirely under the control of the operator; for which purpose it is requisite both, that a surgeon have a very steady hand, and that he hold his instrument in the most advantageous way for effecting the kind of incision he is about to practise.

The art of handling a bistoury has been reduced to set principles, and we must early begin, and long persevere in accustoming ourselves to the practice of these first elements of operative medicine, if we aspire ever to be distinguished for the ease and elegance with which we employ the knife. In vain would the best informed man in existence as to surgical theory, attempt the most trifling operation, unless he had performed it several times at least upon the dead body; the awkwardness, heaviness, and irregularity of his actions would proclaim immediately to every by-stander, that he was deficient in experience. Constant practice then, is in this respect, absolutely indispensable; it is the only means by which that precision, that ease, and that harmony of movement, by which a great surgeon is distinguished, can ever be acquired; which he executes without reflection, even in circumstances of the utmost difficulty, and in which, had his coolness been disturbed, he would have been perfectly excusable.

The different ways of holding the knife are called the *positions.* They have been reduced to five principal ones, which are named numerically, to avoid the necessity of re-describing each under every operation in which it is called into use.*

* We beg leave to suggest that the reader, in perusing this section, do so *with the scalpel in his hand.* By following the motions described in the text, its meaning will be rendered perspicuous, and its fidelity will be ac-

The First Position.—The bistoury is held, as it is said, like a writing pen: the edge turned towards the cubital edge of the hand; the thumb and fore-finger rest with their fleshy part on either side against the rivet which joins the handle to the blade; the middle finger, stretched flatwise upon the latter, may glide from haft to point, and thus control the depth of the incision: the ring and little fingers resting on the neighbouring parts, furnish a point of support for the hand. In this position of the bistoury, it may, by the action of the medius finger resting on the middle of its blade, be turned in a vertical direction between the thumb and fore-finger, as upon a pivot. At its highest elevation, the point of the bistoury, presented perpendicularly to surfaces serves for puncturing. Different degrees of obliquity again, assist in sections; the utmost point of inclination makes an angle of at least thirty degrees with the surfaces which are to be cut: this is a point in which the end of the handle rests in the interdigital groove which separates the thumb from the fore-finger. As in the first position, the bistoury cannot be made to lie parallel to the surfaces of parts, it is evident from that very circumstance, that it can be serviceable in the performance of small incisions only. The instrument presenting obliquely to the parts, offers but a very small portion of its edge to each which is to be divided; it cuts by pressing rather than by sawing, and the first position is therefore that which is peculiarly proper for the performance of short, but deep incisions. Such are the opening of certain deep-seated abscesses, the puncture of the lachrymal sac particularly; that by which the canal of the urethra is entered in the lateralized cutting for stone, &c.

However, we may effect an incision of three or four inches and even more, with a bistoury held in the first position; but as the operator acts partly with the hand elevated, the manipulation is not so easy. The procedure is as follows:—The bistoury is held obliquely, and the fulcrum is the cubital edge of the wrist, which is applied below the spot on which we are to make our incision. Then, extending the fingers, we puncture the integuments by a prick which slants from without inwards, and we prolong the incision by drawing back the blade of the bistoury towards the palm

knowledged; and thus, what might otherwise appear to be unimportant and tiresome minuteness, will, in truth, be found to be a most valuable practical lesson on the surgical uses of the instrument.—*Trans.*

of the hand by flexing the fingers. The method of operation is readily conveyed by the mere perusal of the above description, and when there is no object for doing it, it is merely triumphing over a difficulty to resort to it.

Before we proceed, we think it proper to observe that all our remarks are founded upon the supposition that the bistoury is held in the right hand. Of course, in applying the precepts to manipulations with the other, the relative expressions which point out the directions of the incisions must be taken in a contrary sense.

Modification of the First Position.—Holding the instrument as aforesaid, we obtain a change of position by turning the bistoury between the thumb and fore-finger until it presents obliquely, as if to cut in a direction contrary to that which it usually takes; that is to say, having its back towards the surface to be cut, and its blade towards the hand of the operator. The handle, in this position, rests against the last two phalanges of the fore-finger, which are strongly flexed upon the first: the middle finger is placed upon any part of the blade, and the ring and little fingers serve as lateral points of support for the hand. This way of holding a bistoury is convenient in cutting from within outwards, and from left to right, or from within outwards, and from before backwards.

Second Position.—This differs from the preceding one only in having the edge of the bistoury turned in a different direction, viz., towards the radial edge of the hand, the thumb and fore-finger meeting upon the rivet, and the medius extended upon the blade; the handle falls more or less low into the space between the fore-finger and the thumb. This is resorted to in practising incisions from within outwards, either in proceeding from oneself, or from behind forwards, or else from right to left.

Modification of the Second Position.—An analogous change of position is obtained in this as in the first described manner of holding the bistoury, by a rotatory vertical movement of the instrument upon its pivot, so that the cutting edge which was turned obliquely upwards, is on the contrary, turned obliquely downwards, the back towards the palm of the hand. The position of the fingers is the same, and the incision is from without inwards. Finally, we shall remark, as it regards the two modifications now spoken of, that with the right hand they serve to effect motions which may be made by different positions of the left. There is this advan-

tage in using this hand, that we can always see clearly what we are about, whereas if we are operating with our right hand, the motions of the instrument are sometimes concealed by the great bending forward of the joint. The positions which so far correspond as that they may be substituted the one for the other, are for the first of these modifications, the holding of the bistoury in the left hand in the second position; and for the second modification, holding it in the first position of the left hand. Nevertheless, as there is always some advantage to be gained in changing the position of the bistoury in the same hand, we think that young beginners should practise the use of it in both hands, and in different directions, so as to acquire equal facility in its management with either.

Third Position.—In this position the cutting edge of the bistoury is turned down towards the surface upon which we are to operate, its back being uppermost, and towards the palmar surfaces of the fingers; the third or ungual phalanges of the medius finger and thumb press perpendicularly by their tips upon either side of the rivet which joins the handle to the blade, the thumb being extended, and the medius finger flexed in its two last articulations at a right angle. The fore-finger is free and projected forwards; it passes easily, either along the flat or back of the blade, from point to heel; and is thus useful, in the first place, in giving firmer hold of the instrument; and in the second, for limiting its penetration in making a puncture, when it is applied upon the point, or for aiding in the section of the parts, by adding at pleasure to the pressure. Lastly, the annular and little fingers, which are flexed like the medius, rest upon the outer surface of the handle, and raise the free end of the bistoury up against the palm of the hand, at the articulation of the first phalanx of the little finger with the fifth bone of the metacarpus. The firmness which this situation of the knife imparts, prevents it completely from lateral deviation.

Of all the positions, the third is that in which the bistoury is most perfectly under the power of the hand. The ease wherewith its edge is laid parallel to the surfaces below, enables it to cut with a sawing motion throughout its whole extent, which not only makes a neater incision ultimately, but one easier and more speedy for the surgeon, and less painful for the patient. By the various degrees of depression at which it is laid upon the parts, we may at pleasure vary the depth and extent of our incisions. If to the

numerous advantages thus stated, we add those which are obtained by the different uses made of the fore-finger, we shall readily admit the general superiority of this position over the first, in the applications which are common to both, namely, incisions which are made from without inwards. Its only objection is that of giving some little clumsiness to the action of the hand, which is chiefly performed by the joints either of the wrist or shoulder; but lightness and speed in operating we here see, are sacrificed for steadiness and command of hand in manipulating. It will be noticed likewise, that in the fifth position, which is but a very trifling alteration of the third, the instrument is more movable and suspended as it were, and that therefore it is better adapted for such operations as call for the exercise of extreme delicacy.

The third position is an excellent one in almost all incisions made from without inwards, but above all when the direction in which we are operating is from right to left. We may particularize scarifications, the tying of arteries, the opening of extensive purulent deposits in phlegmonous erysipelas, free detachments of fascial frena, and the extensive incisions which are made to relieve the congestion in cases of carbuncle, &c. We ought to mention that, in cutting from in front backward, we should bend the body a little to the left, so that the eye may follow the course of the instrument. If we are compelled to cut directly against ourselves, the third position cannot be maintained, for the bistoury is covered by the wrist and concealed from view, and we find it difficult likewise to disengage it from the wound. We must, in such a case, assume the first position, which has this two-fold advantage: the surgeon sees better what he is doing, and the greater mobility of the handle of the instrument makes it much easier suitably to conclude the incision.

Fourth Position.—The situation of the fingers is precisely the same in this as in the third position; the direction of the instrument alone is changed, its cutting edge looking upwards or towards the palmar edge of the fingers, and its back being turned towards the surfaces to be incised. The hand evidently is constantly supposed to be held in a state of slight pronation. Its chief employment is in making incisions from within outwards, and from right to left; but in cutting from within outwards and from behind forward, or before oneself, the second deserves a preference over it.

Fifth Position—Is described by saying that the bistoury is held like the bow of a violin. As to the placing of the first four fingers it is identical with the third position; the situation of the little finger alone is different; for instead of pressing the end of the handle against the cubital edge of the hand, it is raised up and disengaged. In this position, the instrument enjoys the utmost possible freedom, and the principal motions are effected with the wrist. The instrument may be offered to, and used upon the parts with equal ease, either flatwise or edgewise.

First Variety.—To cut from without inwards, we lay the edge directly upon the surface; but the fifth position is not in this case generally selected, unless, having arrived at a certain depth, we begin to cut very cautiously, and through a very small thickness only of tissues at a time, for fear of wounding important parts by penetrating too deeply. The lightness with which the instrument is held is such, that with it we can just graze the surfaces, and quickly draw back upon the least threatening of danger. The sections, in this case, are performed by little pronatory movements of the wrist, which are assisted by very gently balancing the bistoury between the thumb and fore-finger, by alternate elevation and depression of the fore and ring fingers. This manner of holding the instrument is best adapted to such cases as require a part to be laid bare without being wounded, as for instance, an artery upon which we are about to put a ligature, or an encysted tumour which we desire entirely to remove.

Second Variety.—Holding the bistoury flatwise is greatly resorted to for performing resection, excision, and the removal of tumours. When the part to be removed is of considerable size, say an enlarged mamma which is to be detached from off the pectoralis major muscle, if the hand is placed in a state between supination and pronation, and its cubital edge turned downward, we may lay bare a very considerable extent of parts, right and left, by large sweeps of the fingers passing from extension to flexion, and offering the edge of the bistoury to the tissues successively from heel to point. It is easily conceivable, that without altering the way of holding the instrument, we may cut thus from left to right, from before backwards, or from behind forwards, merely by turning the radial edge of the hand downwards instead of the cubital, or according as we turn its back backwards or forwards; which, in

other words, amounts to our being able to cut circularly, without altering our position relatively to the patient.

We ought, however, to observe, that in these large incisions, it is not only unnecessary that the little finger be held up, but it would indeed be troublesome in this position, by preventing the blade from lying perfectly flat. It is better that it should be placed like the ring finger upon the side of the handle, and it then adds to the steadiness with which the latter is held. This position, which is not precisely the fifth, differs yet more from the third: for, instead of the end of the handle lying against the cubital edge of the hand, it is, on the contrary, removed from it for the entire length of the semiflexed little-finger. To recapitulate; it is apparent that, as the bistoury, in it, is held flat, the fifth position is one of the most useful of all. It is advantageous from the rapidity, extent and certainty which it permits to operative manipulation; and whenever it can be substituted for any other, is doubly serviceable: to the patient, by shortening the operation, and to the surgeon, by giving, if he be a man of dexterity from repeated practice, grace and freedom to his motions.

There are yet two other positions, which, though not alluded to in assigning the numerical denominations to the manner of holding the bistoury, deserve notwithstanding to be pointed out, because they are employed tolerably often. We shall call them the sixth and seventh, as we shall have frequent occasion hereafter to name them, and shall so avoid being obliged to characterize them each time by their particular uses.

Sixth Position.—We thus denominate that in which the instrument acts flatwise, or by a *dedolatory* movement. To do so, it is necessary that the blade be presented with greater or less obliquity, or absolutely flatwise to the part. The bistoury is held between the thumb and middle finger, which are semiflexed, and opposite to each other on either edge of the handle where it joins the blade. The fore-finger is applied upon the back of the blade, a little in advance of the middle finger. The ring and little fingers are lowered upon the same edge all along the handle, and hold it lightly against the base and palmar surface of the little finger. One surface of the bistoury held in this position is uppermost, and the other inferior; its edge is towards the person who operates. The position affords great lightness, and should take the place of

the first variety of the fifth, when, in tying an artery, we have laid bare the sheath of the vessel, and have only to cut it through to expose the artery itself. The instrument presenting, in this case, the back of its blade to the vessel, cannot possibly involve it, whilst its edge and point are cutting amongst the neighbouring tissues. In order to perform the same kind of section upon the other side of the vessels, without altering the position of the hand, the instrument is made to perform such a movement of semi-rotation between the first three fingers and the thumb, as that they mutually change edges. In this manner we obtain for it an inverse position, in which the back of the knife is towards the operator, and the point and edge may act in the way we have mentioned already for the opposite side. It is scarcely necessary to add that the edge is not always applied flatwise, but that we give to it at pleasure, according to need, such an inclination, either in the direction of its length or width, as may be judged to be requisite by the circumstances of the case.

The sixth position becomes indispensable when the important parts upon which we are operating are deeply seated, because the fingers, which do not go much beyond the level of the lower surface of the instrument, are not inconvenienced by unexpectedly encountering the neighbouring edges of the wound. In a contrary case, when parts are superficially or freely laid bare, as generally occurs in the dissection of the envelopes of a hernial sac, this sixth position, or the third may be used indifferently, directing, if the latter be selected, the bistoury flatwise or more or less obliquely.

Seventh Position.—In it, the opened instrument is laid flatwise upon the palmar surface of the articulation of the second and third phalanges of the last three fingers. The thumb and medius finger meet opposite to each other upon the upper and lower surfaces of the blade. The index finger is placed a little further on under the blade; the last three fingers are semiflexed, and fasten the free end of the handle against the upper and inner part of the hypothenar eminence. This position, like every other, is a double one, according as the edge is turned towards the palm of the hand or the tips of the fingers. It is used, flatwise directed, for the performance of oblique punctures, which are made to end sometimes in an incision from within outwards, by elevating the edge of the bistoury. The section of the intercrossing of the crucial and T

incisions is of this kind. We push on the instrument in the direction of its length, and may limit the depth to which it penetrates by pressing upon the flat of the blade with the fore-finger of the other hand.

INCISIONS WITH THE BISTOURY ALONE.

These are distinguished, in accordance with the direction given to the line of the incision, into straight and curved; the latter of which are circular and elliptical.

STRAIGHT INCISIONS.

These are performed from without inwards by pressure upon parts, and from within outwards by raising them upon the blade of the instrument. Their execution may be divided into four very distinct periods; first, that of the introduction of the point, or the puncture; secondly, that of the lowering of the blade, which is done more or less obliquely or parallel to the parts; thirdly, that of the section, either by drawing or pushing; fourthly, that of the perpendicular elevation of the knife, to remove it from the wound.

Incisions from without inwards, and from left to right.—Let us suppose that we desire to open an abscess, or lay bare any extent of parts at a given depth. We begin by placing the ulnar edge of the left hand upon the parts perpendicularly to the direction in which we are to make our incision, and, crowding back the integuments outwardly and to the left, stretch them in a direction contrary to that which the progress of the instrument is to follow. Then lowering the hand until the thumb and fore-finger are semiflexed and lie upon the skin, they are opened and made to press on either side, so that the new tension thus exercised shall strike the direction of the first at a right angle. The bistoury being held in the right-hand in the third position, and the parts in this condition, we offer the point to them perpendicularly in the space comprised between the left thumb and fore-finger, and plunge it in to a suitable depth, which depth is controlled by the fore-finger, as we said in speaking of the positions. When we are opening an abscess, we are made aware that we have entered its cavity by the want of resistance felt, and the appearance of pus on the sides of the blade. Having effected our puncture, we depress the bistoury so as almost to be parallel with the surfaces; and by a motion of the hand from left to right, incise the parts, graduating the pressure according to the depth to which we are to go.

Finally, when we have given to the incision its proper length, to cut the skin neatly at the orifice, we elevate the bistoury anew, and bring it out of the wound as perpendicularly as it entered it.

Incisions from within outwards, and from right to left.—To execute these, the thumb should be stretched forth, and the palm of the left hand applied flatly, and transversely to the direction of the incision. This hand will be placed to the right of the wound, so as to obey the precept of stretching the integuments in a contrary direction to the track of the bistoury. This instrument we hold in the fourth position in our right hand; its point we offer to the skin; and, having punctured it, the ulnar edge of the right hand resting upon the dorsal surface of the left hand, we are to lower the edge of the bistoury so as to cut obliquely, raising the parts upon the edge and pushing from before ourselves.

It is of importance to attend to the degree of inclination given to the blade during the section. The bistoury, in proof of this, tends, when held perpendicularly, to descend in depth as it progresses; on the contrary, if it be too much inclined, its back being parallel almost to the surfaces, it does but make a superficial incision, and often even, from a sinking of the parts before its point, cuts its way out very speedily. An inclination of about thirty degrees, is that which is generally best calculated for cutting to an equal depth throughout. The parts are raised obliquely, and slip with ease, as they advance successively, along the inclined edge of the instrument. Lastly, when the incision has been made of sufficient extent, it is finished by a vertical elevation of the bistoury, which is withdrawn from the wound in the manner of which we have already spoken.

An incision from within outwards is of much less general application than the preceding, but it is better, however, for effecting the opening of large abscesses attended with detachment. As in these cases, the fluids flow out as fast as a passage is made for them, the integuments sink of themselves, and adhere to the opposite parietes of the cyst. If then we attempt to enlarge the incision, and begin from within outwardly, we run no risk of wounding the bottom of the abscess, for the soft and floating parts to be incised, are raised up by the bistoury; and for a contrary reason, if our incision begin from without inwards, the pressure necessary to continue it would evidently subject us to the danger of cutting subjacent parts.

A straight incision is not always performed flatwise upon the skin. It would be manifestly dangerous to do so every time that

an important part lies directly, or at a depth of a few lines beneath the skin. Of this kind is the operation for hernia. In this case we resort to a peculiar procedure, which to be practicable, however, requires that the skin at the spot which we desire to cut shall adhere only by a very lax cellular tissue to the parts below.

Incision upon a fold of the skin.—We collect between the thumb and fore-finger of each hand, the integuments upon either side of the line which the instrument is to take, and by raising them up, a fold results from placing back to back the two cutaneous surfaces. This fold will be found to take a direction transverse to that of the incision we are about to make; the right side we give to be held by an assistant. Then applying our bistoury, held in the third position, in the interval between the fingers of the surgeon and those of his assistant, we make, from the heel to the point of the instrument, a section which divides the fold from top to bottom. If we are still fearful of involving the subjacent parts, we may offer the point of the instrument held in the fourth position to the base of the fold, pierce it by a puncture, and bring out the edge at the top. Having effected our section in either of these two ways, we have, on letting go the skin, an incision which is twice greater in extent than the height of the cutaneous replication.

We have before seen how a bistoury is to be held for making a dedolatory incision. This species of section is useful in the ablation of excrescences from the skin; and is besides proper in all cases in which it is necessary to use great circumspection in going to any depth: such, for instance, as dissecting the coats of a hernia, laying bare an artery, and removing encysted tumours. In the first of these uses, an incision made in the sixth position is itself the whole operation. To perform it, a convex bistoury is selected. It is presented laterally to the tumour; and by a sweep of the edge from heel to point, we excise the excrescence at one stroke, by a kind of semi-circular movement, the bistoury, in the first instance, being turned downwards for the attack, next lying flat under the tumour, and lastly, raised to complete the section. It is frequently necessary, in order to remove any prolongations of the excrescence, to embrace it with the left thumb and fore finger, and to draw it out from the surface of the skin. In this way its roots may be got at to a considerable depth. When the disease is of a nature to return, as are the cancroid excrescences on the face, for which we have previously recommended the use of the arsenical paste, this precaution is indis-

pensable. It does not belong to our plan to describe minutely the manner of making the incisions in the sixth position for the larger surgical operations alluded to above. We shall merely observe in a general way, that, in this kind of section, we seize with a pair of dissecting forceps the tissues which are to be incised, and in order to isolate them, raise them off the subjacent parts; the blade of the bistoury, obliquely presented, then cuts them, passes flatwise under the points of the forceps, and should then be elevated by describing a series of manœuvres in the direction of a quarter of a circle produced by gently balancing the knife between the thumb and fore-finger. When performed in this way, the dedolatory incision requires much lightness and steadiness of hand on the part of the surgeon; it is, amid the great variety of sections which occur in the manipulations of great operations, one of the most difficult, and which it is highly important to do well. We have, upon this consideration, not passed it over in silence.

The straight incision, the utility of which upon so many occasions has already been demonstrated, is not in a like degree suitable to the removal of tumours. If they are of small size and at but little depth, we may hope to isolate and remove them through the lips of the wound; but, if they lie at a great distance and beneath fasciæ, and are extensive, a straight incision will not suffice. Neither will it answer in many surgical diseases, in which we must denude surfaces of an extent and depth more or less considerable. The varieties of incision which in these cases become necessary for fulfilling the indication, are, besides the elliptical, those which have been called, from the shapes they assume, the crucial, the T, and V incisions; all three of which are modifications merely of the straight incision, as they are composed of two sections of that kind, which are described in the way suggested by each of the above denominations.

The Crucial Incision.—One of the two straight incisions of which it is constituted, is made from left to right; the other is in two halves, which join the first section at a right angle, on both sides. The incision from left to right is done with the bistoury held, as we have said, in the third position. As to the other two, one is to be made from before backwards or towards oneself; the other from the operator and from behind forwards. In the execution of the first, the parts are made tense with the radial edge of the left hand, whose back is turned towards the operator. The bistoury is held

in the third position, the wrist abducted, the instrument lowered perpendicularly upon the transverse incision, and, by drawing it towards oneself, a section is made which joins the other, and makes two right angles. To execute the second cut, we make the integuments tense with the cubital edge of the left hand. The hand which holds the bistoury is pronated, and is strongly rested upon its cubital edge; the point of the knife is turned directly against the operator. Proceeding then in the manner above stated, a new section is made which is perpendicular to the first. The necessity of performing the incision which intersects that from left to right, at two strokes, instead of doing it at once, is sufficiently evident. If, indeed, it were to be done at the same time, begin it upon which side we might, after we had completed one half, we should find that the integuments of the other lip of the horizontal incision from left to right, not being stretched tense, instead of allowing themselves to be divided, would escape from the edge of the knife.

The section of the two halves may be performed in a manner wherein the direction is different from that of which we have just been reading: that is, from within outwards. The instrument is introduced by piercing underneath each lip of the first division. To cut from oneself, the bistoury, held in the seventh position, and its cutting edge looking outwardly, is slipped parallelly under the skin. When it has reached a suitable distance, we right the instrument, its edge coming upwardly; make a puncture to bring out its point, and finish the section by lowering the handle a little and drawing it towards us. To make the second cut, in the motion of pronation and adduction which turns the point towards the operator, the bistoury is held as if for making the dedolatory incision, the edge looking inwards. Except this, the same motions are performed for this as for the preceding incision, but in an inverse direction.

When the three cuts which constitute the crucial incision are ended, each flap is to be detached. The angle of each is raised by the thumb and fore-finger of the left hand, or a blunt (dissecting) forceps, and the bistoury is slipped underneath from its centre to its point, always preserving some cellular tissue adherent to the skin. The instrument is held in various positions, according to the sides upon which we are incising. Thus, instead of passing from the third to the second or fourth position, it is better to employ the variety of the fifth, in which the fore-finger rests with the others on the side of the handle. In this situation of the bistoury, we are

enabled to perform four kinds of incisions, with no other changes than those of the wrist, which alternately move the edge of the blade from left to right, and from before backward. In all cases, whilst detaching the flaps, we are to use the instrument in such a way as to obtain all the effects possible at each stroke. Here again the position which we advise is the best that can be chosen in this respect.

The ease with which a crucial incision allows of a quadrilateral surface being laid bare, makes it to be resorted to under a great many circumstances; upon the head, and on other parts, so as to apply a trephine; over hernial tumours, to denude the sac which contains the intestine; and in a very great variety of cases of extirpation of solid or encysted tumours. It has the advantage of not obliging us to remove flaps of integuments which are not diseased. When the operation is over, we reapproximate them, and if the case permits, they are readily brought to unite by the first intention.

The T Incision.—It differs from the crucial in that one branch of the perpendicular section is wanting. Save this, the mode of its performance is identically the same as that of the preceding one, and the flaps, as in it, are also to be detached and turned up. The only remark of which it admits, is that it is not so good as a crucial incision for removing a rounded tumour, one, that is to say, whose diameters are nearly equal; and that the T incision is preferable for one that is ovoid, or wherein one diameter is much greater than the other, such as frequently that of crural hernia is. The largest incision is made on the edge and parallelly to the length of the tumour; the smallest is lowered according to the extent of the lesser diameter. It is evident, nevertheless, that a crucial incision may almost always take the place of the T incision, whilst the former, in cases in which it is demanded, cannot be supplied by the latter.

The V Incision.—This is the least employed of any of the sections composed of rectilinear incisions. The divergence of the two cuts will vary according to the object for which they are designed.

The V incision is performed either upon free surfaces or free edges. In the former event, the bistoury is held in the third position, and the first section is made from without inwards, according to the established rules; and, starting from a point at a greater or less distance from this one, we bring down a second incision, which,

without going beyond it, must join it again, forming with it an angle of greater or less acuteness according to the width of the base of the flap. This form of incision is devoted to like uses with the crucial incision, or that of the T shape; but were it necessary to lay bare an extent of parts sufficient to make the angle exceed forty-five degrees, it is clear that it would be far better to resort to one or other of the preceding.

The V incision on loose edges is made either from without inwards, or from within outwards. It is employed very often, in special cases, in the lips, for example, in the removal of a cancerous tumour, or for excising the edges of the congenital fissure in the operation for hare-lip. When performed from without inwards, the incisions may be brought from the free edge to a common point of union, or, starting from it at a certain distance, they may be brought to it again. To cut inwardly, we pass the flat of the blade under the loose edge as deep as is necessary; turn up the point of the bistoury to pierce from within outwards, and conclude the section by turning the cutting edge obliquely upwards and drawing it towards ourselves.

ELLIPTICAL INCISIONS.

Two elliptical incisions are invariably made; and they are practised always when it is thought advisable, in a case of extirpation, to remove with the disease a part of the superincumbent integument.

Three chief conditions need to be observed suitably to perform incisions of this kind; first, even tension of the integuments; secondly, obliquity of the instrument according to its length and the perpendicular position of its edge as regards the parts; thirdly, fidelity in following the curve which the incisions are to describe.

The operator, by making pressure with the ulnar edge, or the tips of the fingers of his left hand, stretches the integuments on that side; and an assistant does the same on the other. Holding his bistoury in the third position in his right hand, the surgeon then performs his first incision from left to right and from without inwards. The assistant, whilst this doing, is to give his undivided attention to make the tension uniform and steady before the edge of the knife. The latter will form an angle of forty-five degrees with the surfaces, so as to cut for a few lines only above its point. But for the observance of this caution, the bistoury might not cut

the whole thickness of the skin, and would moreover, divide it inevitably in a straight line, the more its inclination coincided with the parallelism of the surfaces. The surgeon should follow the curvilinear track with great care; for unless he does so, his hand, accustomed to tracing right lines, will often wander hither and thither from the curve which it should describe. Lastly, here as in every incision, the edge must constantly be held perpendicularly to the surface of the skin, the natural effect of a lateral deviation being to make a sloping incision.

The first cut being ended, we make the second in conformity to the above precepts; but, as the two sections are to meet at their extremities, it is moreover hard to cause the last made to strike with evenness upon the point where the former ends. To guide his knife with the certain precision required in such a case, and particularly when the part to be removed is some bulky tumour which conceals the transit of the instrument, the surgeon must ever have present to his imagination the line which he is to follow. If he is not certain of his hand, and confident in his eye, he would do well, before he begins his incision, to mark in ink the course which his bistoury is to pursue.

Elliptical incisions are oftenest used in the removal of subcutaneous tumours of a great size, particularly the testes and mammæ in a carcinomatous state; by means of them we are enabled to remove along with the disease, the attenuated or altered integuments by which it is overlaid. It is not for us, in the plan to which we are restricted, to describe these operations; but we may remark, that in making incisions, we should ever begin with that which is *lowermost*, that in our progress we may be the less inconvenienced by the flow of blood.

Elliptical incisions, again, are useful in correcting the deformities which result from scars upon exposed parts of the body, the face and neck, for instance, in persons of scrofulous habits. The adventitious cutaneous tissue of which they are made up is removed by dissection, the incisions being made conformably to the directions heretofore laid down, and the lips healed afterwards by the first intention.

INCISIONS WITH A BISTOURY UPON A DIRECTOR.

Thus far we have spoken only of such incisions as are made with a bistoury guided by the hand of the operator alone. It is, how-

ever, often necessary, when we are to penetrate to a considerable depth, to supply it with a director by which it shall be brought nearer to the parts which it is to cut, and be separated from those which it is to spare in its progress.

The finger, which is, as M. Dupuytren says, a feeling instrument, is therefore the best of all directors; but it cannot be used in any but those rare cases in which there exists an opening large enough to admit of its introduction. If this can be done, we are, after having insinuated our left fore-finger into the aperture, to slide in flatwise, upon its dorsal surface turned upward, a probe-pointed bistoury; when we reach the spot at which we mean to make the incision, we turn its edge up toward the parts which are to be divided, and leaning the bistoury a little to one side, cut by pressure and a sawing movement, as for other incisions from within outwards.

But as the orifice through which a director is introduced is generally small, whether it be a morbid erosion, the effect of disease, or an aperture artificially created, it is much more common to use a grooved staff or probe, instead of the finger.

The Grooved Straight Staff, or Director.—This is a metallic stem, five or six inches in length, its width decreasing from two lines near its outer end to one line between its extremities. On one surface, there is a groove of a half or a quarter of a line in depth; the other surface is a smooth and convex back. It is very essential that the polish of the instrument shall not in any part of the extent of this groove be interrupted by an inequality capable of arresting the progress of the bistoury, or, of throwing it aside from its course. The largest end of the staff (or, as we call it, the *director*) terminates in a flat plate, split in the middle, eight lines wide and ten long. This plate serves to hold the director by; the slit is intended for the reception of the frenum linguæ, to raise the tongue in the operation for the section of that septum. The tapering end is usually blunt, so as not to wound the parts through which it passes. Some are sharp however; the point, by a sort of puncture, passing more easily through the cellular tissue. In this end terminates the groove; it finishes by a small cul-de-sac to oppose the further passage of the bistoury. These instruments are made of many metals: of steel, of gold, of silver, and of platinum. They are made either flexible, or unbending; the former are of silver which is not tempered; and from the possibility of bending them at pleasure to suit any curvature, they are often best adapted for fistulous passages.

The cases which demand the use of a grooved director vary according as there exists or does not exist an aperture; as there are two between which we are to cut; as there requires to be made a counter opening; and lastly, as there is a deep frenum to be divided.

To make an incision upon a grooved director through a previously existing aperture, we take hold of its plate in our right hand, between the thumb and the palmar surface of the second joint of the middle finger; the fore-finger stretched forth upon the back of the staff, serves to direct it. The integuments are always to be stretched in a direction contrary to that of the instrument, with the palm and cubital or radial edges of the left hand, depending on the direction of the operation. We introduce the small end of the director to the required depth; then let go the integuments, remove the instrument to the other hand, without any change in its position; and using the fore-finger as a fulcrum, balance the instrument, by lowering the thumb and raising the middle finger, so that when brought parallel to the skin, it may lift up the parts which lie over it. Next, taking a straight bistoury, held as if for an incision from within outwards, that is to say, in the second, or what is better yet, the fourth position, we introduce its point into the opening, and slide it along the groove in the director, as far as the terminating cul-de-sac, holding it at an angle of thirty degrees, which is most favourable for the parts to be cleanly divided by pushing and cutting, as they glide over the instrument. Having come to the end of the groove, we elevate the bistoury a little, and finish the section perpendicularly, to leave neither cul-de-sac or slope; then, the two instruments not having parted contact, we withdraw them together from the wound, to be more certain that no parts between the staff and the skin have escaped incision.

Having thus acquired a knowledge of the manner of making sections of this kind, we perceive how easy it is to vary them in every way, following the antero-posterior or transverse diameters; and in every intermediate degree. The precepts laid down for incisions from within outwards are always to be adhered to in performing them. Incisions on a director, are often resorted to for enlarging the openings in very many abscesses, for laying open the sinus of a fistula, and for dividing large detachments of the skin.

When there are not any openings, a mere puncture will place us in the same condition as before, and then we need only act as above

laid down. If, on the other hand, the case requires that we should cut between two openings which communicate by a track more or less tortuous, we pass in the director at one opening and bring it out at the other. The bistoury, sliding along the groove, soon lays them both into one wound, which, without a director would be very difficult, and require some dissection, for fear we might not stop in time if we were acting from without inwards, and, if from within outwards, from the extreme difficulty of following the irregular passage of a fistula with a straight and inflexible blade, without injuring its sides, or the vessels which might traverse them.

If there should exist one opening only, but, so very narrow, or in such a situation as that the pus tends to collect either at a point the most depressed as to the position of the part, or separated from the aperture by sinuosities which prevent the advance of the fluid, a counter opening should be made opposite such a collection to facilitate its evacuation.

This is to be done by the introduction of a grooved director into the fistulous orifice in the manner we have described. When it has reached the fundus of the abscess, we lower the plate of the director by pressing on it with the thumb against the fore-finger, which, though it continues to act as a fulcrum, rises. By this manipulation, the instrument describes a seesaw motion, and its tapering end raises the parts from within outwards. We then perceive the projection which it makes through and under the integuments, unless the parts which lie between them and the corresponding wall of the abscess be not too thick. Taking then a straight bistoury in his right hand, and holding it in the first or third position, the surgeon cuts the tissues from without inwards down upon the groove of the director. After this preliminary puncture, he enlarges his incision either from without inwards, or from within outwards; the latter procedure is the best. To strike the director, the incision may be made in two ways. If its point seems almost to be subcutaneous, or the surgeon is very sure of his hand, he may, by a single stroke, come at once down on the end of the director, with his puncture, but if otherwise, for fear that the bistoury might slip off the sides of the instrument, and wound the parts beneath, it is better to make two or three incisions, particularly when there is a great thickness of parts to be gone through. We then bring out the director at the opening we have made, to be sure that it communi-

cates with the fistulous collection, and thus enlarge the incision in the way before described.

In closing our remarks, we may add, that in all incisions made with directors, the parts to be divided are always to be stretched over the groove of the instrument, and that, when our operation is to be performed in the vicinity of large blood vessels, or of important organs, we should, before ever we use our knife, assure ourselves that of these species of tissues none run any risk of being injured.

INCISIONS MADE WITH SCISSORS.

Scissors are steel instruments with two cutting edges, which are opposite the one to the other, and situated at the extremity of two levers joined by a screw on which they move transversely over each other. Scissors when closed, present but a single stem by the juxtaposition of the two levers or blades to a state of parallelism; when opened, they describe an X by the simultaneous divergence of the branches of the blades, to which the screw acts as a common support. The branches, at their free ends, terminate by oval rings placed on the sides. The great diameter of the rings or handles is obliquely outwards, to adapt itself to the obliquity of the situation of the fingers which are to be received in them.

The edge of a pair of scissors, like that of a bistoury, results from the junction of two plane surfaces; but, instead of being the sloping summit of an angle of about ten degrees as in the knife, it represents one of seldom less than forty, and is often yet more open; the more acute therefore the angle of the square edge of a pair of scissors is, the better do they cut. It is needless to add that, like every instrument of the class, it has perpendicular denticuli.

It has been shown that bistouries and other instruments which consist of a single flat blade, cut rather by a sawing motion than by force of pressure; with scissors it is quite the reverse; they cut by pressing rather than by sawing. Section, indeed, with these instruments, is effected merely by the meeting of the two blades, following a circular movement, as all levers do, so that it is not, as with the bistoury, a denticulus which passes parallel over the tissues, and which is necessarily followed by all the others, constituting the edge, which add their action to that which preceded them. Here, on the contrary, every denticulus, as it falls, produces by its pressure the effect required; and the incision in all the following points will be effected by the corresponding denticuli successively.

But, the parts, to suffer incision, must accommodate themselves to the form of the angle of divergence of the cutting edges between which they are included, and must consequently, before they are cut, undergo in succession all the degrees of intermediate pressure. The contusion inflicted in this way is very much greater when the parts which lie in the grasp of the instrument have great thickness. This is one of the weightiest objections which is urged against scissors, as instruments for cutting living flesh; and accordingly MM. Percy and Laurent reprobate their use in the section of firm and highly sensitive parts, like the skin, and mention particularly, cases of excision of callous or detached edges of venereal buboes with scissors, having been followed by sphacelus. By inverse reasoning, the same observers point out the advantage which is derived from the use of this instrument in preference to the bistoury in sections of flaccid and membranous tissues, destitute of any point of support.

As is the case with all other levers, whose power augments always in proportion as the fulcrum approaches the resistance, scissors cut most powerfully when their branches are longer than their blades, and the more this disproportion is, the greater is the strength. This fact has been turned to account in the manufacture of scissors for the operation for hare-lip. In general, scissors which are made use of most commonly in surgery, those in the pocket-case for example, are constructed of such dimensions as that the branches are one half longer than the cutting part, or, in other words, constitute three-fifths of the whole length of the instrument.

Of scissors, three species are distinguished: viz., the straight, the crooked, and the bent. Straight scissors are more employed than the other two kinds together. Crooked scissors may have the curve either upon the surfaces or the edges; a curve on both edges in one direction presents us with a very convenient instrument for sliding over parts, and following their undulations. Scissors that are curved on the flat side, are much employed in ablation, excision and extirpation of tumours, fungous growths and excrescences of different kinds. They are made of different sizes, from those which are employed for the excision of the cervix uteri, and whose length is considerable, down to the very delicate ones used for the excision of the varicose capillary vessels in the affections of the conjunctiva called pannus and pterygium.

But scissors answer very much the same purposes as the above

mentioned species. The inflexion commences at the beginning of the blade; it forms an angle of one hundred and forty or one hundred and fifty degrees, or, in other words, supposing the branches to lie upon a horizontal plane, the blades ascend from it at about thirty or forty degrees. This kind of scissors also may be bent upon its flat side, or on its edge, and it is easy to insinuate them into deep seated parts. A pair of scissors of this kind, bent on its edge, is used by M. Roux in performing the operation of staphyloraphy.

Scissors are most conveniently held by the thumb and ring fingers; they alone have the advantage of forming, by their introduction into the rings, a right angle or nearly so with the branches of the instrument; by which arrangement, the cutting edges meet in a like plane. The slightest obliquity of the fingers, by effecting a leaning of the blades to one side, causes a distension of the parts to be cut, which slip between them, and are torn and twisted, instead of being regularly divided. This is very often seen in using scissors with the left hand.

The middle finger is always placed upon the branch in front of the ring finger; the uses of the fore-finger, however, vary with the kind of cut which is to be made. If we design to cut lengthwise, it should be placed on the branch with the medius finger, and in front of it, they then acting as auxiliaries to the ring finger, in antagonizing the thumb. If we are to cut flatwise, we stretch forth the fore-finger on the rivet, whence it directs the motions of the instrument. If the parts offer a slight resistance, and we cannot bring our left hand to the assistance of our right, the fore-finger, placed crosswise upon the branch held by the thumb, will serve to oppose the medius, on the other branch. Lastly, if we are operating deep down in a cavity, where we cannot see our way, and are afraid of wounding important parts, the fore-finger, introduced between the blades, will aid in the section of the tissues which are to be cut, and put aside those which it is not wished to involve.

Besides all this, in whatever way the scissors are held, we ought to avoid including too great a mass of parts between the blades, whilst making our incision; for, from so doing, there occurs a backward motion of the branches, and the tissues, yielding in a contrary direction, are lacerated and contused. A similar occurrence takes place by pulling towards ourselves, after we have got the tissues between the blades of the instrument. From the first of these

difficulties we may protect ourselves by never presenting more than two-thirds of the length of the blades to the part; and may guard against the second, by giving to the cutting edges a mere motion of opposition, in approximating them.

With scissors we perform various surgical operations. Incisions are not commonly made with them; those in the hare-lip section are, however, exceptions. Cuts into cellular tissue or fasciæ in cavities, are more common, and a grooved director is then employed to guide them. Excisions of membranous parts, such as the uvula, frenum linguæ, prepuce, the membranous sides of cysts, gangrenous flaps, &c., are frequent in practice; we raise the parts with our fingers, or with blunt forceps, and cut them with curved flat scissors. In all cases of lacerated wounds, we remove the ligamentous tissues, ends of vessels, &c., which are more or less torn, with scissors, which are much more convenient than bistouries, as they do not require any tension of the parts, previous to their action. Finally, either curved, flat, or bent scissors, serve for the ablation of warts, fungosities, and various excrescences from the skin and mucous membranes. They possess an advantage over the bistoury, insomuch as that by offering their convexity to the tumour, to make it protrude between their edges, they remove it at a stroke; but this has, on the other hand, the disadvantage of bruising the parts, and of being more irritating than the incision with the knife, therefore, upon parts which are previously highly irritated and very sensitive, we ought not to use them.*

PUNCTURES AND SCARIFICATIONS.

These are superficial wounds made with the therapeutic view of effecting an evacuation of accumulated fluid, or of producing derivation or revulsion.

* Most surgeons recommend the use of a bistoury in the operation for hare-lip, and Mr. S. Cooper says, "that the edge of the fissure should never be cut off with scissors, which constantly bruise the parts which they divide, and a sharp knife is always to be preferred." Knives, however, are apt, if not skilfully used, to jag and cut unevenly; scissors do not. Dr. Mott has long employed these instruments for paring off the sides of a hare-lip fissure, and with perfect satisfaction and success. To any one familiar with the unvarying elegance of this great operator, no assertion is necessary, that in neatness the section cannot be excelled. The blades of his scissors are straight, long and sharp, and the cut made rapidly.—*Trans.*

Punctures differ from scarifications in being of but trifling extent either in width or depth. The length of a scarification is generally much greater. As it regards depth, there are scarifications of two kinds; one which involves merely the epidermis and rete mucosum of Malpighi, as in *scarified* cupping; and deep ones, which not only go through the skin and cellular tissue, but sometimes even the parts subjacent.

The best instrument for making punctures is a lancet: with it we make little incisions, like those for bleeding, at greater or less distances apart.* Their object is to give exit to effused blood, or to serous infiltration. In the latter case particularly, two or three punctures in the malleolar region, or on the back of the hand, are often sufficient to effect in a single day, the subsidence of the integuments of the upper or lower limbs, which before the operation had been enormously distended by anasarca. But the process is not wholly unattended with danger. It is not uncommon in œdema which is symptomatic of organic diseases of the heart and lungs, for gangrene to seize upon large portions of the integuments, as a result of these trifling punctures, and much caution must therefore be used in performing them.†

Scarifications are made with a lancet, or a bistoury. The latter instrument, when we are to extend them to any depth, is preferable for two reasons, which depend on the configuration of the blade; it is more extensive, and cuts a greater surface at the same time, by which the suffering of the patient is lessened; and, being much firmer, there is no danger, which there might be with the lancet, of breaking it off in the wound.

Two other instruments besides exist, which, as they are used for making this species of incision, are called *scarificators.* One is the invention of Baron Larrey; it consists of a flattened and jointed stem, with a handle like that of a common bistoury at one end. At the end of the stem is a sharp nail-shaped blade of semicircular

* To do this, a better way is to open the lancet at an *obtuse angle;* and holding it lightly between the thumb and fore-finger of the right hand, by the ends of the handle, its point towards the part, to allow it to drop quickly and by its own weight upon the seat of infiltration.—*Trans.*

† Instead of punctures, M. Dance advises simple linear incisions, half an inch or an inch long, excessively superficial, and *only involving the epidermis.* They answer, he says, a good end, and are never attacked with sphacelus.—*Dict. de Méd.*—*Trans.*

form, which goes off from it at right angles. The small belly of the blade prevents it from cutting too deeply, but does not secure it against the opposite objection, for it cannot, very often, be made to cut enough. This scarificator, moreover, offers no advantages over a bistoury, for it allows, like the latter, of our making only one scarification at a time.

The other scarificator is a metallic box of cubital form; that surface which is applied to the skin is perforated by a series of parallel fissures, which allow of the exit and passage of an equal number of semicircular, sharp disks, called lancets. By a peculiar internal mechanism, the instrument may be either *set*, or remain at rest. The blades are attached to a movable axle, which allows us to approximate them to, or remove them from the fissures for a given distance. The lancets and slits are more or less numerous, from eight to twelve, and even sometimes more in the same scarificator. For use, we commence by setting it; and, by pressing on a trigger, every disk acting as a lancet flies out at once, and scarifies the skin for the whole length of the slit which gives it exit; for, in the circular movement whose impulse it obeys, it passes out at one angle and re-enters at the other. As the axle which supports the blades is susceptible of ascending and descending, it is evident that we may at pleasure vary the depths of our incisions. The scarificator is convenient enough in practice, from the advantage which it allows us of making instantaneously a number of incisions; but cannot, manifestly, be used elsewhere than on the surface of the skin.*

We return to the consideration of the use of the bistoury. It has been shown, in treating of cupping, how superficial scarifications are to be made. Deep scarifications are but ordinary incisions; and are performed by holding the bistoury in the third position. We make but one cut in the usual way, between pressing and sawing, to the depth required, which ought to be uniform throughout the incision; and thus several parallel scarifications are made.

At the present day, the value of deep scarifications in cases of sphacelus of the limbs, once so much in vogue, is a subject of dispute among surgeons. Many French, and the majority of English ones, incline to reject them. In fact, they either penetrate to the living parts beneath, and we may then inquire, what is to be gained by cutting through tissues which are deprived of vitality; or else,

* See article on cupping, for a mention of this instrument.—*Trans.*

they go beyond the limits of the mortification, and cannot but add a new irritation to that which previously existed, and perhaps, by its excess, increase the depth of the gangrene they had been intended to arrest. But the case of the scrotum, for instance, is not parallel, when gangrene in it results from infiltration of urine, both owing to the irritation of that fluid in the cellular tissue, and to the distension it causes there and in the skin.* The scarifications, in this case, being intended to evacuate the fluid which is the cause of the disease, ought to be performed down to the very seat of the effusion or infiltration. We have seen several patients at the Hotel Dieu, who were laboring under furious mania, symptomatic of this urinal infiltration of the scrotum, recover as if by magic the full possession of their intellects, as soon as M. Dupuytren had freely scarified the parts.

In all cases wherein scarifications have been made as means of evacuation, that effect may be aided by slightly pressing flatwise, and slowly, from places at a distance towards the wounds, and by placing the scarified part in a depending position. This graduated pressure will, according as the liquid is of greater or less consistence, as it is infiltrated or effused, and as it needs to be wholly or in part evacuated, prove equally advantageous in many œdematous inflammations; as of the eyelids; in the penis and prepuce after phymosis and paraphymosis; in the labia majora of the female; in many circumstances which bring about tumefaction, and particularly in certain cases of labour in which the head has remained too long a time at the lower strait of the pelvis; in a word, whensoever there simultaneously exists a serous and inflammatory congestion in parts supplied with an abundant and lax cellular tissue, which allows itself easily to be distended by an accumulation of fluids. Scarifications are often used, after the manner of rubefacients and vesicatories, as derivative and revulsive means: in which case they are superficial. They are applied upon joints affected with white swelling, opposite parts which are the seats of chronic rheumatism, or upon the walls of the chest and abdomen, in many diseases of

* And we may add, when gangrene is threatened from a misdirected injection for the cure of a hydrocele, the matter of injection passing, not into the cyst, but amid the scrotal tissues. In that case, free and immediate incisions into them, directly upon the discovery of the accident, alone can save the patient from his impending fate, which, if not death, is universal gangrene of the part.—*Trans.*

the organs which those cavities contain. If we design to produce only a local irritation, we add to the effect of the scarifications by applications of a more or less stimulating nature, under the different forms of poultices, fomentations, lotions and liniments. Lastly, when in certain cases it is proper to effect sanguineous depletion from the capillary vessels upon the surface of the mucous membranes, and from the conjunctiva in particular, tepid emollient lotions, in aid of the scarifications, may suffice; but upon the skin, and in parts more especially where that membrane is at once thick and but scantily supplied with capillary vessels, we rarely obtain a discharge of blood sufficiently abundant, unless we apply the cupping pump over the scarifications in the way that was recommended in the description of that instrument.*

OF PUNCTURING.

This word, which is derived from the Latin *pungere*, to pierce or prick, means in surgery, the action with which a piercing instrument is introduced into the soft parts.

There are differences between punctures according to the ends for which they are made, and the instruments with which they are effected. Puncturing is often an operation in itself; such is the *bird-peck* puncture, the opening of certain abscesses with a lancet or a bistoury, and that which is made with a trocar for evacuating collections of serum: it is likewise, as will be recollected, the *first period* of certain incisions.

In speaking of incisions, we mentioned how in such cases punc-

* No allusion is made by the author to the recent employment, by Messrs. Lawrence and Hutchinson, of free and very extensive incisions of the inflamed skin and subjacent adipose and cellular tissues, which in phlegmonous erysipelas, after a fruitless trial of other means, is often attended with the happiest results. With a scalpel, incisions six to eighteen in number, two or three inches apart and an inch and a half in length, are made, which discharge freely both blood and pus and give great relief. To this practice, however, Mr. Samuel Cooper objects. (See Surg. Dict. Erysipelas.)

It is nevertheless recommended by M. Rayer; who states that he has likewise seen a free crucial incision into the scalp, through the skin, cellular tissue and occipito-frontalis aponeurosis, put a sudden stop, after the failure of all things else, to all the alarming symptoms produced by erysipelas of that part, which occurs from trifling injuries, operations, &c. He recommends that the incisions be kept apart by lint, until all tumefaction disappears from the scalp.—*Dis. of the Skin. Paris*, 1827.—*Trans.*

turing was performed, and to this subject or that of the bird-peck puncture we shall not now return. It is chiefly such as are intended to evacuate abundant collections of serous fluid, or of purulent matter, which are now to engage our attention.

Of the Puncturing of Abscesses.—When a small abscess, consequent upon phlegmonous inflammation, has formed in the subcutaneous cellular tissue, it is proper to give vent to the fluid within it, lest by adding to the irritation, it should cause the secretion of a fresh quantity; the effect of which might be detachment of the integuments, and the formation of sinuses. A well timed puncture in such a case as this will often prevent all ulterior mischief. If the skin is very thin, a lancet will suffice; if not, it will be necessary to use the bistoury. Let us suppose that the employment of this latter instrument has been determined upon. Holding it in the first position, we pass in its point vertically until, from the want of resistance, which to a practised hand is very evident, and by the appearance of a drop of matter upon the side of the blade, we are made aware that we have entered sufficiently deep into the cyst. We then withdraw the bistoury in the same position, pressing upon the back of its blade a little to prevent it from cutting afresh. The pus now flows out, mixed with streaks of blood in quantity proportionate to the vascularity of the part. We aid in its expulsion by gentle pressure; but must not, under pretext of obtaining a thorough evacuation, persevere long enough to give pain. This would at once be useless and imprudent, for new matter must inevitably form, which must pass out at the wound before a cure can ensue; and, this second suppuration, moreover, is to bring with it the detritus of cellular tissue, which in a majority of cases, will have been sphacelated by the inflammation.

The abscess being emptied, it is customary with many practitioners, lest the wound should heal too quickly, to keep it apart by a tent of lint besmeared with cerate; the fluid then escapes by the tent, as fast as it is secreted. With simple abscesses this is a precaution which is scarcely needed after a few days. Many eminent surgeons even think it better to leave the wound quite alone, unless a new collection of matter forms, when they open the orifice with the blunt end of a probe. In every case, when the suppuration begins to be succeeded by a sero-purulent discharge, when the skin resumes its natural thickness, and the inflammatory symptoms dis-

appear, we ought to remove all foreign bodies, as they can then produce no other effect than to impede cicatrization.

The Puncturing of Congestive Abscess.—It is not very uncommon to see purulent collections appear in certain parts under the skin, the cause of which is not to be found in the seat itself in which the matter is deposited, but at a point generally somewhere above. These are called abscesses from congestion; and are also called chronic, owing to the length of time which it takes to produce them. Young scrofulous children are most generally the subjects of this vexatious malady. Caries of bone is the most common cause to which they are owing, and that particularly of the lumbar vertebræ, and sometimes of the dorsal also; thus more of them point at the groins and inner and upper part of the thighs, than at any other place. For fuller details as to the progress, symptoms and occurrences of this disorder, we refer to our article upon abscesses, and shall here confine ourselves to the subject of their puncture. We will take as an illustration, the case of an abscess which points at the inner and upper part of the thigh.

The principal thing to be attended to in performing a puncture of this kind, is to guard against the access of *air* into the cavity of the abscess. Experience has taught us, in these cases at least, whatever John Bell may say as to the innocence of that fluid, that its entrance is soon followed by fatal results. The bistoury, which is used for this operation in France by Baron Boyer, and which in England was employed by the late Mr. Abernethy, is preferable to the trocar of which Mr. Crowther makes use. The following is the procedure generally adopted.

The surgeon provides himself with a bistoury having a long and tapering blade, which he holds flatwise in his right hand, in the seventh position. Having slightly stretched the integuments with the thumb and medius finger of his left hand, he slowly insinuates the point of the bistoury, which he guides by means of gentle pressure with the tip of his left fore-finger placed upon the upper surface of the blade. Such a direction should be given to the instrument, as to make it pass *very obliquely* between the tissues. As soon as the flow of pus announces that it has penetrated to a sufficient depth, it is directly withdrawn; but, before we disengage the blade, we are to make slight pressure with our

left hand upon the tumour, that the flow of pus may occur *instantly* upon its removal. By continuing the pressure, the sinking of the parietes of the abscess is effected in proportion as the fluid is discharged, and the quantity which issues through the wound is, in this way, always sufficient to prevent the least bubble of air from entering the cavity of the sac. If, which very often happens, some remains of cellular tissue, by appearing at the opening, arrest the flow of pus, we must remove them with forceps, and continue to press behind them that the matter may directly follow their extraction. According to the size and extent of the fistulæ and the abscess, we obtain from one ounce to two pounds even of pus. Pressure sufficient to evacuate the whole of the contents is not necessary, since a reaccumulation of the collection is inevitable, and experience has besides proved that to make it, would be to add to the alarming hazard of inflammation on the sides of the cyst. When, therefore, the diminished bulk of the tumour or a slackening in the stream warns us that pus enough has been withdrawn, we interrupt the discharge by pressing down the upper lip of the wound with the fore-finger, and apply a strip of adhesive plaster to prevent it from re-opening. It is manifest, that in the exercise of these precautions, the access of air into the cavity of the abscess is rendered impracticable.*

Usually the cyst will be found to be filled again in a few days, and a new puncture will be called for. M. Boyer has performed five or six in this way, at intervals of more or less extent, and has succeeded in obtaining a successful issue in cases, wherein the older surgeons, who were in the habit of opening them very largely, would inevitably have lost their patients.

We shall here mention, to give it unqualified reprobation, the method which some surgeons in different countries pursue, of introducing a catheter or canula into the wound, and of fastening it in by attaching strings to its outer end which go round the diseased part. The advocates of the method assert that it allows of our evacuating the abscess, with great ease at pleasure, through the tube, by merely taking out the cork with which it is customary to stop the open end. But, by this method, the introduction of air can in no way be prevented, as it will always enter between the sides of

* The plan of valvular openings originated with Mr. Abernethy. See his Surgical Works, Vol. 2.—*Trans.*

the canula and the lips of the wound, particularly as the presence of the instrument gives rise to irritation, and produces an enlargement from ulceration of the edges; and lastly, this dangerous and unsound practice is often followed by sphacelus, and almost necessarily by the hectical symptoms which result from the introduction of the air which ought never to have been allowed to enter.

Of the Puncture of Dropsy or Ascites, called Paracentesis Abdominis.—The serum which accumulates in the peritoneum as the sequel of chronic phlogosis or secretory irritation of that membrane, is evacuated by means of an instrument called a *trocar.*

A trocar consists of a round metallic stem inserted into a handle. The point is formed of the junction of three surfaces, each having a cutting edge. The stem or blade of the trocar is fitted to a silver sheath or canula, narrowing at one end, so as to cling like a spring to the point of the instrument, so that some little difficulty is experienced in withdrawing the trocar from the tube. The end of the canula which comes close up to the handle, opens into a funnel-shaped top, which was, by J. L. Petit, made into the shape of a spoon on one side, to facilitate the flow of the fluids. There are trocars of various sizes, according to the kind of puncture which it is intended to perform. Accordingly, we have a trocar for paracentesis distinct from that for hydrocele, &c.

The accumulation of serous fluid which gives rise to dropsy of the abdomen may be contained either in the entire cavity of the peritoneum, or in partial sacs, which are formed partly of the serous membrane, and partly by organized morbid adhesions. The first of these varieties constitutes *ascites;* the second is known under the appellation of *encysted dropsy of the peritoneum.* Other and different serous collections, besides these, are met with in the cavity of the abdomen; such as dropsy of the ovaria, hydatids of the liver, uterus, &c. We have thought it our duty to mention these diseases, merely to put the surgeon upon his guard in case he should meet with them; but of course, have in this place, merely to consider the puncturing of an ascites in particular.

Peritonitis, which becomes chronic from being originally an acute affection, though the most usual cause of the secretory irritation which creates dropsy, is nevertheless not the only one. All long standing inflammations of the liver, stomach, bowels, or uterus, various disorders of the mesenteric ganglia, and many kinds of tu-

mours and organic growths are capable of a like result, by producing sympathetic irritation of the peritoneum for a long while. The surgeon should ascertain for himself which of these causes has produced the disease, in order to judge of the fitness of the puncture, the symptoms wherewith it may be attended, and the dangers which may result from its performance.

Tapping is indicated only when the distension of the belly by the fluid is sufficiently great to interfere with the exercise of the functions of respiration and digestion. The abdomen is spherical in shape, of a size vastly disproportioned to that of the other parts, its walls powerfully stretched and very tense, and the abdominal ring widened, and as it were, obliterated. By laying one hand flatwise upon one side of the lower belly, and striking the opposite side sharply with the tips of the fingers of the other hand, the sense of fluctuation from the presence of the fluid is easily detected.*

The *things needed* for performing paracentesis are, first, a trocar; secondly, two vessels; one but small, in which the fluid is caught, and a much larger one, such as a tub for instance, into which the smaller one is emptied every time that it becomes full; thirdly, some compresses to cover the wound; and fourthly, a body bandage as a support for the abdomen after the operation.†

These being all at hand, the patient seats himself upon a low chair, or, better still, lies upon the edge of a bed, and the surgeon proceeds to fix upon the spot which he is to puncture. In this selection several precautions must be taken. Generally speaking, we should neither introduce the instrument over the region of the liver, nor upon the known track of the epigastric and internal mammary arteries, nor opposite any tumour which may be felt to project beneath the abdominal parietes. Many spots have, under ordinary circumstances, been selected as the most suitable

* See note V. in the Appendix.—*Trans.*

† By many surgeons a lancet alone is used for the puncture, and a blunt edged, or rounded canula with lateral eyes is then inserted. With us the body bandage is always put on *before* the operation. It consists of a sheet which is folded narrow, crossed in front of the abdomen, and an end held on each side by an assistant. As the water flows, the sheet is tightened by pulling on its ends. The object of this is to guard against the alarming consequences which often follow the removal of pressure from the blood-vessels and viscera, by uniform graduated compression.—*Trans.*

for the performance of the puncture; such as the flank, the linea alba, the vicinity of the navel, the groin and the cavities of the rectum and vagina. We shall not here enter into a discussion upon the comparative advantages or disadvantages of either of these localities, which would be much too extended a digression, but shall rest satisfied with a description of puncturing in the flank. Indeed this part possesses more advantages than any other, from its depending situation when the patient lies upon his side, but more especially from being away from any large vessel or organ, which, by offering resistance, might be endangered by the point of the trocar. According to Sabatier, that spot in the region should be chosen, which exists at the intersection of two lines, the one vertical, which extends from the edge of the false ribs to the crista of the ilium, the other transverse and reaching from the umbilicus to the vertebral column. To us it appears, that in this somewhat uncertain description of the perpendicular line, owing to the diversified extents of the cristæ of the ilia, the surgeon might be led to introduce his trocar too far backwards towards the region of the kidneys, besides which the lumbar arteries are here of considerable size. We therefore think that a more positive indication, which would at the same time present a more faithful image of the steps as they are usually taken, would be to recommend that the vertical line be dropped from the false ribs to the anterior and superior spinous process of the ilium; or else to advise the puncture to be made at the angle of intersection of a transverse line starting from the umbilicus, and of an oblique one, drawn from the sternal appendix or ensiform cartilage, to the anterior superior spinous process of the spine of the ilium. In either of these places, we are sufficiently far from the epigastric or lumbar arteries.*

Having decided upon the seat of the puncture, the patient lying

* The situation here recommended by the author, is not that which is generally adopted; and by Mr. S. Cooper, Sir A. Cooper, Mott, Gibson, and most eminent surgeons in this country or in Great Britain, a spot *in the linea alba, an inch below the navel, or midway between it and the pubis*, is advised; the bladder being previously emptied. The abdominal parietes do not yield equally, particularly on the sides, and hence no dependence can be placed on the situation of the linea semilunaris in dropsy. With every care, the epigastric artery may be wounded. That occurrence was met with by Mr. Cline, whose patient died.—*Trans.*

upon an inclined plane in bed, his body gently flexed backward, so as to present the tense side in an opposite direction, one or two assistants, standing opposite the surgeon, crowd up the abdomen with the flats of either hand, for the purpose of adding to the tenseness at the part at which he is to operate. The operator then takes his trocar; holds its handle in the palm of his right hand, his last three fingers supporting it upon the side; and his fore-finger stretched out upon the blade at a distance from the point, which should not exceed by more than a few lines the presumed thickness of the abdominal parietes. Then, by a sharp stroke, he plunges the point of the instrument through the very tense integuments; his fore-finger controlling the depth to which it is allowed to pass. It is, in this operation, highly important to offer the trocar perpendicularly to the parts; for, but for this, instead of entering the peritoneal cavity, it may slip up and lodge among the muscles of the abdomen. When the want of resistance and mobility of the point of the instrument, which in every species of puncture into cavities that are full of fluid are perceptible, indicate its being in the midst of the collection of liquid, the operator seizes the canula between the right fore-finger and thumb, and with the same fingers of the other hand, draws away the handle; the serum flows out forthwith in a full stream.

When the quantity of the liquid to be evacuated is very considerable, the discharge continues for a good while before it becomes necessary to exercise careful pressure to aid in its expulsion. Sometimes, however, it suddenly ceases. Generally this occurrence is owing to albuminous flakes or adventitious membranes which block up the canal, or to a piece of omentum or a knuckle of intestine, placing itself in front of the orifice of the tube in the abdomen. With a view to re-establish the flowing of the stream, we resort to the introduction of a blunt probe, in the first case, to extract the floating bodies which are the obstacles, and in the second, to push back the viscera. This must be done with great care, lest the intestines be pierced by it.* By giving to the canula a different inclination, this latter occurrence is prevented from happening again. As the subsidence succeeds, upon the evacuation of the water, more accurate pressure is employed to bring the fluid from various points in the abdomen up to the

* A female catheter is better than a probe for this purpose; but with a rounded, eyed canula no such difficulties occur.--*Trans.*

mouth of the tube, and this is continued until the whole quantity contained is discharged.

When the operation is over, the surgeon, in order to draw out the canula, seizes its external orifice with his left thumb and fore-finger; presses the two edges of the wound lightly together with the fingers of the other hand; pulls gently upon the instrument, disengages it with ease, and withdraws it.

As dressings, small compresses are laid over the wound, and a body bandage applied with some tightness. The effect of the pressure is to support the abdominal parietes and to increase their resistance. It ought, from this latter circumstance, to be kept up steadily after the operation with a view to prevent, in some degree, a return of the dropsy, until such times as the inconvenience experienced from a re-collection of fluids compels us to lay it aside.

Many untoward occurrences may happen in the progress of the operation of paracentesis; of which the chief are fainting and hæmorrhage.

Of the cause of syncope after tapping, various explanations have been given; we ourselves regard that as the most plausible which attributes it to an accumulation of blood in the abdominal vessels, which find themselves suddenly unembarrassed after having been for a long time pressed upon and contracted beneath the weight of a gradually increasing force. This species of syncope appears to us to be one of those in which the collapse of the heart is owing to a kind of emptiness of the cavities of the right side; the blood, which is their natural stimulus, does not, owing to this very stasis in the ramifications of the portal vessels, reach the heart in sufficient quantity for its regular contraction. It is customary to make use of the inhalation of stimulant vapours, such as camphor, vinegar, cologne water, &c., as means of dispelling this faintness; and certainly they do act as stimulants to the nervous system. But we consider, that to apply directly over the lower part of the belly a bandage with considerable firmness, is a much more efficacious proceeding.

Hæmorrhage, unless we have been so imprudent as to operate in the vicinity of large arteries, is generally supplied from the veins. Sometimes it results from the puncture of a subcutaneous vein, the size of which is generally much increased. We should, before we operate, examine the track of these vessels, and try to avoid them. When, however, after we have tapped, the blood begins to flow pretty abundantly, we must decide as to whether it is venous or arterial.

If arterial, and we have performed our incision in the spot recommended, it cannot come from any other than the capillaries, and we should endeavour to arrest its flow by pressure. By adopting the plan advised by Bellocq, we shall do this the more effectually. It consists in introducing into the wound a wax bougie flattened in such a way as to form a kind of cork. This, owing to the wick in its centre, it will be easy to extract entire. When the hæmorrhage consists of venous blood, slight pressure will generally put a stop to it. In every case, however, let the ingenious plan of Baron Dupuytren be had recourse to; which is to make the patient draw a number of forced inspirations for a considerable time. The activity to which, by this measure, the circulation in the pulmonary arteries is aroused, tends to empty the right side of the heart, and thus, by accelerating the passage of blood in the vena cava, is productive of a kind of aspiration in the venous branches which obliges that fluid to resume its wonted route.

Tapping is merely a measure of palliation, to which, from time to time, it becomes necessary to recur. Not only it does not remedy the secretory irritation which had called for its use, but it keeps it up, and increases it by the greater ease with which the serum can be exhaled into a cavity, which having already been distended beyond its elasticity and power of contraction, offers a more imperfect resistance to a new collection of fluid. Accordingly the oftener a patient is operated on, the oftener does the necessity of another performance of the operation recur.

Medical writings are filled with records of this kind. In some, among others, the number of operations performed within a few years upon a single patient appears really prodigious. Such, for instance, is that very rare case of Dr. Mead's, in which tapping was sixty-five times performed; of Callisen's, in which it was done one hundred times; and an account in the Philosophical Transactions, of its having been done one hundred and fifty times. Lastly, we may mention, but merely to stigmatize it as fabulous and beyond all possibility of belief, the case, related by Bezard, of a patient, who in thirteen years submitted six hundred and fifty-five times to the operation of paracentesis.

However credible the statements of these different authors may be, and even admitting that the narrations are falsified and exaggerated from a love of the marvellous, it is not certainly uncommon to encounter patients who have more than ten times undergone it.

Hence it would appear, that if this operation does not cure ascites, it is at least not often threatening to the life of the patient. Now, as it is each time productive of very great relief, we should have no hesitation about performing it, when no serious contra-indication exists in the case.

Of the Puncture of Hydrocele.—Watery effusions into the scrotum are called hydroceles; and three varieties, that by *infiltration*, that by *effusion*, and that which is *encysted*, are known. The seat of the first, which in fact is merely an œdema, is in the cellular tissue of the chord; the second occupies the cavity of the tunica vaginalis; the third forms in adventitious cysts, and is met with either in the testes, or at any part of the chord. It is our intention to confine ourselves to the puncture of that which collects in the vaginal tunic of the gland.

This, which is the seat of hydrocele by effusion, sometimes communicates with the cavity of the abdomen; and if so, the fluid collected coming from the abdomen, the puncture would not only prove useless, but would not be wholly unattended with danger. This arrangement of parts is but a continuance of that of the fœtal state, and necessarily exists from the period of birth, whence the hydrocele is called *congenital*, by way of distinction from the more frequent occurrence, in which the canal leading into the peritoneal cavity is closed, and the fluid is secreted by the serous membrane itself, called the tunica vaginalis. We shall enter into no detail of the causes, which may give rise to this affection, which are by the way but little understood; and shall merely mention that sarcocele, varicocele, different inguinal herniæ, and hydroceles of other kinds may be mistaken for it, or will be found sometimes to coexist. We pass likewise, in silence, over the various methods of treatment proposed for its radical cure, as to enter upon them would lead us far beyond the subject on which we are engaged.

An effused hydrocele may be treated by puncture at any period of its duration: but it is not legitimately called for until the hydrocele has attained to such a size as to give pain, and interfere with the motions of the patient. The following are the characteristics of the malady. One side of the scrotum, from the bottom towards the inguinal ring, forms a pear-shaped tumour, which fluctuates, is tense and shining; the greater its bulk is, the more it tends to be spheroidal. By placing this tumour between the eye and a candle, in the dark, it appears evidently transparent. But in some few

cases, in which the fluid is bloody or turbid, this characteristic may fail. By striking upon the tumour, it offers resistance in front; but at its back, at top and inwardly, unless the distension should be too great, we perceive a hardness, which is caused by the presence of the testicle. When the hydrocele has attained to a very great size, it invades and covers the scrotum of the other side, and the integuments of the penis. The latter organ appears buried, as it were, in the upper part of the tumour.

We cannot here enter into the diagnosis of the disease, as to whether it is simple or multilocular; whether the coverings of the testis are sound, or morbidly altered in various ways, &c., and for similar reasons to those which have obliged us to decline speaking of diseases which simulate a hydrocele, we are forced to avoid all consideration of the various circumstances which embarrass and obscure the diagnosis. It is, we think, sufficient for us to have described the disease as it is in its simple form, and to advise the inexperienced practitioner to abstain from the operation in cases of uncertainty. We may, however, remark, that as it is important not to make mistakes between ordinary hydroceles and those which are congenital, we may be certain of having met with a case of the latter kind, when we find the external abdominal ring sufficiently dilated to admit the finger easily; when the tumour is of an elongated form, and when, by attempting to reduce it by that orifice, we can return the fluid into the peritoneal cavity; lastly, when upon the patient being made to lie on his back with his pelvis elevated and the tumour upheld, it spontaneously disappears.

There is no simpler operation than the puncture of hydrocele. The patient is seated upon a chair, or, what is still better, lies in bed on his back, with his thighs separated. The surgeon stands by the side of the tumour, seizes its anterior surface with the palm of his left hand, grasping it laterally and below with his fingers; and sliding his hand downwards crowds the fluid towards the bottom of the scrotum, the lower, fore, and outer part of which he causes to project, where the puncture is to be made; for, be it remembered, that the testicle is almost always found at the place directly opposite. When the hydrocele is very large indeed, we direct an assistant to support it underneath, and he also is cautious to make the integuments equally tense at all points. Then taking a small trocar, and holding it as for tapping, the surgeon plunges it into the serous cavity, limiting the depth of its penetration with his

fore-finger; the trocar is withdrawn, and the canula left in, through which the water flows. We shall lay no stress upon the guidance of the tube, as that was done fully when speaking of paracentesis; as to the pressure which is to force the fluid towards the orifice, it must clearly be made from the chord to the fundus of the scrotum; and the power which is exerted must be gradually increased as the evacuation proceeds, until the last drops of serum have been expelled through the canula.

Were we to remain satisfied with puncture merely, we should, indeed, have afforded the patient a temporary alleviation; but we should not have cured the secretory irritation, and the serous cavity remaining lax, a re-accumulation of fluids would very soon commence as in ascites. To effect a radical cure, it is clear that one of two results must be obtained; we must either remove the secretory irritation, or we must cause an adhesion of the sides of the tunica vaginalis, by producing an inflammation within it. Such is the obscurity which reigns in the etiology of the disease, that we cannot fulfil the first of these indications. The second alone, then, remains to be effected; and art has enabled us to do for this serous membrane, owing to its limited extent, what prudence forbids us to attempt upon any other. The best way to inflame the tunica vaginalis is to throw into it a slightly stimulating injection, by means of a syringe whose point is adapted to the outer orifice of the canula through which the serum was discharged.

Different mixtures have been proposed with which to make the injection. In very many instances, and the means have always succeeded, we have seen M. Dupuytren make use of strong red Rousillon wine, in which some of the Provins rose leaves had been boiled, in the proportion of two ounces to the pint. His plan is to make three successive injections, each of which lasts for three minutes; but before he does so, he satisfies himself as to the canula being within the sac. If, by moving the mouth of the canula from side to side, the inner end of the instrument appears to traverse with facility, we may fairly believe it to be still within the cavity of the tunica vaginalis; but if the motion does not appear free, this is a proof, that owing to the retraction which follows the evacuation of the fluid, the serous membrane has abandoned the end of the canula, which will then be found buried among the neighbouring cellular tissue. *Until this sheath has been properly replaced*, we are by no means to proceed with the injection. Pretty

acute pain often follows its entrance, which is generally regarded as auguring well for the recovery of the patient. M. Dupuytren, however, has learned by experience, that those patients in whom the pain is not felt in an equal degree, recover equally well notwithstanding.

We aid in promoting the effect of the injection, after the operation, by wrapping the scrotum in compresses steeped in the same fluid. An inflammatory swelling supervenes at the end of three or four days, or earlier, the result of which is the formation of false membranes whence adhesion occurs. We then lay aside our stimulant applications, and, if we think the inflammation is running too high, resort to emollient ones in their place; and suspend the testes in a bag.

After the lapse of a few days more, the swelling begins gradually to disappear; and, on or about the twentieth or thirtieth day, the disease is cured without any probability of return.*

OF PUNCTURING THE LOBE OF THE EAR.

This trifling operation is equally a species of puncture.

* The author has not described the lesser surgery of the injection of a hydrocele, but for which the puncture is seldom of permanent benefit, with his usual minuteness. The instruments required, besides the trocar and canula, are a syringe, or a gum elastic bag having a brass nozzle and stop-cock, either of which should previously be ascertained accurately to fit into the canula; two bowls, one to contain the matter of injection, and the other to receive the water of the hydrocele. The process demands care and circumspection. The gum elastic bag, put up in a case, with the necessary accompaniments, being sold in cutlers' shops and generally used, we shall suppose it to be the instrument selected. Let it be put into warm water, whilst the sac is being emptied. This being done, an assistant fills the bag with the injection; the surgeon holds the canula well up in the tunica vaginalis, nipping, as Sir A. Cooper says, the latter around the tube, between the fore and middle fingers of the left hand, carefully guarding against its retreat from the sac, and its entrance among the scrotal tissues. Next he takes the bag in his right hand, the stop-cock being turned; passes the nozzle into the mouth of the canula, and squeezing the bag, pours on the injection. When the bag is emptied, he withdraws it, and quickly applies the thumb of the left hand over the tube to prevent the injection from escaping. This process is repeated as often as is needed. When the injection has been retained for a proper time, say from three to ten minutes, the thumb is taken off, and every drop must flow out in a stream before the canula is removed. A little lint, or a bit of adhesive plaster is all that the wound requires, and the patient may walk about until pain comes on. (App. Note VI.) *Sir A. Cooper's Lect. Velpeau. Méd. Operat.—Trans.*

It is done with a kind of punch, or with a trocar. In either event, the first step is to obtund the sensibility of the lobe of the ear by pinching it gently between the fore-finger and thumb; and next, we apply against its posterior surface, a cork of moderate elasticity, intended to oppose the pressure caused by the instrument. Upon the left ear we operate with the left hand, and *vice versa*, holding the cork always in the other.

The punch is a steel stem of about half a line in diameter, fitted at one end into a handle, and at the other terminating in a circular cutting edge, with a hole in the middle, like a common perforated key. The needle which serves as a trocar in this case is made either of gold or silver, and tempered to great hardness. It also is fixed into a handle at one end. The other is formed into a conical shaped point. Up to a distance from this point of about two lines, it slips into a little canula.

The operation consists in presenting the point of one or other of these two instruments perpendicularly to the anterior surface of the lobe; and then in making a quick plunge, as in every other puncture. Such ought to be the force of the blow as to transfix immediately the whole thickness of the part, and to bury the point of the instrument for some distance in the cork.

The cork is then laid aside. If the punch have been employed, we remove the little portion of ear which has been cut out by its edge, with a needle, from the hole in the punch. where it will be found. Into this hole we then introduce one end of a leaden wire, and withdrawing the instrument, pressing the wire against the stem, that it may not separate from its guide, we bring it out on the other side. If the canula and conical trocar have been employed, having pierced the ear, we hold the canula firmly and withdraw the stylet. The canula being thus pervious, we pass the leaden wire into it, and withdraw the tube when the wire appears at the other side. Then, no matter how we may have performed the operation, having got the wire into its place, we twist its ends that it may not escape. This metallic seton, by not allowing the fistula to heal, gives rise to a trifling suppuration, of some days duration, and which then ceases. At length, an adventitious cutaneous tissue lines the short passage, and the opening ever afterwards remains unclosed.* †

* We have not thought fit to suppress this short chapter, although we know of no practical utility it possesses, other than as a means of heighten-

OF VACCINATION.

This operation is at once the most simple and the most useful of any. Not only is every surgeon bound to be able to perform it properly, but he must besides be perfectly acquainted with the progress of the vesicle which the vaccine virus engenders, and with the different ways of preserving that virus in a solid or liquid state. It is therefore our intention, first to speak of the vaccine fluid itself; secondly, of the operation by which it is introduced, or vaccination as it is termed; and thirdly, of the appearances which its eruption assumes, or of vaccinia properly so called.

1st. *Of Vaccine Virus, Fluid or Matter.*—Vaccine virus is a colourless, inodorous, viscid and transparent fluid. When exposed to the air it dries at first very quickly without any loss of its translucency. In this state, it is soluble in water, without any loss of its properties. The access of carbonic acid and of air for a long while, decompose it; the latter by imparting to it its oxygen. M. Husson, in his excellent treatise upon vaccine virus, has given us some of the characteristics by which its goodness of quality may be tested. 1st. A drop of vaccine matter, taken between the fingers, is ropy, like syrup. 2d. A lancet, when applied flatwise upon a glass or pimple where it is, sticks sufficiently fast to offer perceptible resistance. 3d. When the vesicle is pricked, the matter issues very slowly. 4th. It assumes the shape of a spherical globe. 5th. It rapidly dries, and makes a gummy looking little lump on the point of the lancet. 6th. When spread over the areola of the vesicle, it forms a brilliant coating of a semi-vitrified appearance, and almost silvery lustre, much resembling the slime left by snails in their track. 7th. When dried upon the skin it puckers it, and when stretched, breaks into little scales, as a coating of gum arabic would do. 8th. Viscid vaccine matter mixes with difficulty with the blood.

Different means have been invented for preserving vaccine virus for a shorter or a longer time, and for enabling it to be transported into distant regions, without undergoing alteration. Those means are found best to answer, which most completely exclude the vac-

ing the charms of beauty, and adding, perchance, to female vanity by allowing of the insertion of ear-rings in the fair sex.—*Trans.*

† For an account of the tapping of the hydrocephalic head, see App. Note VII.—*Trans.*

cine from the triple agency of oxygen, light and moisture, the usual causes of its decomposition. However, these three conditions need not always be exacted with equal scrupulosity. The necessity for precaution will particularly depend upon the length of time which is to elapse between the taking of the vaccine matter and its use. If we take it with an intention of employing it on the same day in some neighbouring place, it is merely necessary to collect it upon the point of a lancet. To prevent it from being wiped off by the handles, we place a piece of paper between their tips in front of the point, to keep them asunder. When it is to be preserved for several days, we place over a newly opened vesicle, two flat squares of glass about an inch in diameter. When they are sufficiently charged, we glue them together by the surfaces which have received the fluid, and lute them with white or sealing wax; the first is best, as it does not heat the glass, which might deteriorate the virus. Then, we wrap up the two plates in black paper, to preserve them from the light. This, as it does not require are any previous great preparation, is a convenient way of keeping vaccine matter; but it is liable to the double inconvenience of spreading the fluid over too extensive a surface, and of effecting the adhesion of the glasses so firmly by means of the vacuum, that we cannot oftentimes loosen them in any way but by breaking them. Doctor Jenner adapted a much better plan. He made use of two plates of crystal perfectly smooth and highly polished; but in the centre of one of them was a small cup-like cavity, capable of holding all the matter which one vesicle could afford. This he filled with the fluid, and slipping the one plate over the other, enclosed the virus in a space devoid of air, and in sufficient quantities to remain fluid; he then luted the edges in the way which we have mentioned above. When the vaccine was to be used, all that was needed to destroy the adhesion between the plates, was to turn them in opposite directions, for they adhered but to a very trifling extent around the edges of the excavation. This little apparatus, as convenient as it is ingenious, appears to us to be so useful, as that we are induced to recommend it to practitioners in the country; its great recommendation is that it allows of our transporting vaccine virus every where about in its fluid state, and perfectly unaltered in properties. Greater certainty might be given to the method by cutting the edges of the crystal plates to slope from their outer to their inner surfaces, so that there

might result from their juxta-position a circular groove, into which the adhesive material, intended to exclude the air, might be introduced; the outer surfaces of these plates again, should be spread with black varnish; and lastly, they might, to prevent their accidental separation, be kept together by little collars of metal received into jags or notches made in the crystal. With these slight modifications, we conceive that the apparatus of Dr. Jenner leaves us nothing to desire.

We shall pass over the description of a very great variety of procedures for temporarily preserving vaccine matter, by means of the impregnation of filamentous substances, which are at once more complex and less certain than those which we have now detailed; but we feel called upon to speak of the invention of M. Bretonneau for its preservation during an indefinite time; and the more particularly that this is the method used for distributing it among the provinces.

M. Bretonneau makes use of small fusiform glass tubes, six lines long and half a line in diameter; their sides are very thin; and their extremities, each of which is two or three lines in length, are drawn out into the most delicate capillary points possible; the tubes ought to be pervious throughout their whole extent. To charge them, we first open a vaccine vesicle. When a drop of serum begins to protrude, we offer the smallest and most tapering end of the tube to it horizontally, and the fluid enters it directly. When the first little drop has been taken in, we present the tube to another, and so on, until it is full. The same end must always be offered to the vesicles; for if, after the operation is commenced, we offer the other end, the contained air cannot escape, and no absorption goes on. One thing sometimes retards the filling of these tubes; it is this: when a considerable time has elapsed between the imbibition of one drop and that of the next, the fluid may concrete at the capillary orifice. If so, we must break off about half a line of the end, and the absorption will proceed as before. When, lastly, the tube is filled to within a line of the top, we seize the point by which the matter was introduced between the thumb and fore-finger, and, without however risking its fracture, compress it sufficiently to prevent the escape of the vaccine; then, to close it, we bring the other end near enough to the flame of a lighted candle, and when the glass fuses, quickly lower our hand. The same thing is next to be done at the other end of the tube. The reason for thus sealing

the tube before it is perfectly full is evident; but for that, the liquid, or the elastic tension of its vapour, would prevent our closing it by fusion, or our approximating the sides of the glass. As a still further measure of precaution, it is customary, after this operation is over, to protect each end with a lute of sealing wax. Thus prepared, the tubes are enclosed in the barrel of a quill, or in some larger cavity, either singly, or several together. To prevent them from breaking by friction during transportation, the interspaces are filled up with bran, sawdust, or what is still better, with charcoal powder. Thus suitably enclosed and protected, they may be sent to the greatest distances, and used with perfect success after a lapse of many years.*

Of Vaccinating.—Four processes are in use for the introduction of vaccine virus, viz., frictions, vesication, incision and puncture.

Frictions are made with a rag, and must be carried to such a degree as to produce excoriation of the cuticle. When this is effected, a small piece of linen impregnated with the virus is laid upon the rete mucosum. The process, which is recommended to be employed in cases of children who dread the lancet, is long, very painful, and uncertain, and deserves to be entirely abandoned.

Professor Osiander has very erroneously commended the use of a *blister*, to lay bare the rete mucosum of Malpighi; it is liable to every objection urged against friction, and is more likely to result in ulceration.

The *incision* is nothing more than a superficial scarification, between the lips of which a thread loaded with the virus is laid. It succeeds better than the two preceding methods; but is more alarming than the puncture, and has less chances for success, beside which, with all possible dexterity and care, it is not unfrequently carried too far, and gives rise to a bleeding wound.

* We are told by Dr. Colhoun, in a note on page 223, Vol. II., of Gregory's practice, that vaccination will succeed from the scab, by slightly triturating it with a little water, and applying it to the wound, where it should be retained for some time by a compress. The scab is effectual, if sealed up and preserved from the air, for more than a year after its removal from the body. It should also be kept as much as possible from heat and moisture. To country practitioners this is useful information, and they should be careful to desire that the scabs may be saved for them when detached.—*Trans.*

The three processes now alluded to are nearly at the present day obsolete, and *puncture* has been generally adopted, from the ease and quickness with which it is done, the inconsiderable pain which it gives, and the almost invariable success with which it is attended.

The instruments made use of for vaccination, are a sharp lancet, or a needle, which is better. The needle should be either of steel, gold or platinum, and of excellent temper. The latter metals are the best, as they do not oxydize. The blade in its whole length is flattened, the heel is large enough to be held easily between the fingers, the point is very sharp, and its edges are cutting; upon one surface is a groove, that the needle may be charged with a greater quantity of the virus.

Having our instrument at hand, we proceed to prepare the matter itself. If we are to vaccinate from arm to arm, all that is necessary is to puncture a vesicle, and a little drop will slowly exude. When we have but one vesicle at command, and several children are to be vaccinated, we must puncture it only as often as we require to use it; for if the vesicle were to be opened at several points at the same time, the matter will have hardened before we can have had time to use it. When dried matter is employed, which has been kept between plates of glass, on threads, or in any other way, we must, when about to insert it, moisten and dissolve it in the very smallest quantity of cold water which will answer for that purpose; and then make use of it in the same way as that which comes first from the pustule. In cases, finally, in which vaccine virus is used from the tube, we are to break both ends; to blow very gently into one of them through a straw, or very delicate pipe of some kind, and when a drop of matter has fallen upon the piece of glass, we take it upon our needle or lancet, and introduce it. Or we may, by scratching the glass tube across in the middle with a file or a flint, divide it into halves, each of which will be a little cup, from whence the matter may easily be taken with the point of the instrument.

The spot usually selected for vaccinating upon, is the arm, at its outer part; not that the operation would be less successful at any other spot, but that this part is chosen as less liable to friction. To add to the chances of success, several punctures are made, and generally three upon either arm. M. Husson leaves an interval between them of about an inch. Some writers have asserted

that about half this distance would suffice. In this opinion we do not coincide, having often seen a separation of an inch necessary to prevent the confluence of the pustules.

All things being ready, the person to be vaccinated either stands or sits before the operator, who takes and places beneath his left armpit the hand of the side upon which he is to insert the virus; then applying his left hand upon the posterior surface of the arm, he encircles it on either side with his thumb and fingers in front, to make tense the integuments in an opposite direction. Then taking his needle, with his right thumb and middle finger resting upon the rivet, and his fore-finger upon the heel, he dips the point lightly into the vaccine fluid, so as to charge it with a very small quantity, presents it to the skin in a parallel or slightly oblique direction, and insinuates it under the epidermis. He must be careful in making his puncture, not to pierce, but only slightly to graze the rete mucosum; for a wound of its capillary vessels might cause a discharge of blood, which would wash the matter out of the wound. The puncture being effected, he allows the needle to remain in for a few seconds, moving it gently backwards and forwards so as more completely to impregnate the wound; and then he withdraws it. Some persons are in the habit of applying their thumb upon the puncture as they take out the needle, to cause an adhesion of the raised cuticle to the wound. We think this to be a bad practice, as it often squeezes out the vaccine, and is productive of a contrary result to that which was intended. It is better to let the wound alone. The other punctures are performed in like manner with the first, each time wiping the needle, and recharging it with virus. When all is done, we let the punctures dry for a little while before the clothes are allowed to fall down over them, lest the friction of their contact should wipe away the yet moist matter from the part. No attention to the wounds is demanded, no dressings are required, and all that is to be done, is to protect them from being rubbed by woollen garments or coarse linen. It is likewise well to take care that the circulation is not impeded by tight dresses.

We may vaccinate at every season of the year, and at every age indifferently. M. Husson states that he has vaccinated the child of but a few hours old and the decrepid old man equally successfully. Two months, however, is the better time; so much so, that according to the same author, not more than one vaccination in fifty fails

of its aim. The trifling ailments of infancy are not necessary contra-indications to vaccination, nor should the existence even of acute diseases be considered as proscriptive of vaccine inoculation during the prevalence of epidemic variola.

Of the Developement of the Vaccine Pustule.—In the progress of a vaccine vesicle, three very distinct stages exist. 1st. The period of incubation. 2d. The period of inflammation. 3d. The period of desiccation.

The stage of incubation supervenes directly upon the puncture. By attentively observing what occurs during the performance of the inoculation of vaccine matter, we shall perceive around the little wound which has been made, a very light rose-coloured areola some lines in diameter. After a lapse of eight or ten minutes it fades away, and a very feeble tumefaction replaces it, which in about half an hour equally disappears. *From this time, up to the third or fourth day,* nothing is visible but the cicatrix of the puncture; and sometimes, when that has been very slight, and no blood has been drawn, even that is wanting and nothing whatever is to be seen upon the part.

The period of inflammation begins from the commencement of the *fourth day.* The seat of puncture first displays a little hardness; and its top soon assumes a purplish hue, not unlike the colour of the bite of a bed-bug. On the *fifth day,* the puncture forms a small conical tumour; and a very active pruritus is experienced. *Up to the seventh day,* the pustule continues to increase; it widens; its central depression is augmented; a raised rim begins to form around it; and a vividly red areola, half a line in width, surrounds the base of the pustule. *On the seventh day,* the depression is fawn coloured and more marked; the rim glows with silvery lustre, and is wider and more flat. *Upon the eighth day,* the matter distends the vesicle; a rosy belt surrounds the areola, and between the pustules the integuments are tumefied. *Upon the ninth day,* the vesicle reaches its maximum of distension; its centre is yet more depressed, and forms a small crust of a blackish brown colour; the areola is vividly red. *On the tenth day,* the rim is flatter and less resplendent; its utmost size is attained to; and the inflammation of the areola offers resistance to the touch. The rosy zones are now blended into each other, a general prominence of the anterior surface of the arm is perceptible, a strong sensation of heat and very acute itching is experienced. It is not infrequent, at

this period, for the vaccinated person to perceive a slight febricular movement, attended with a feeling of general discomfort, and acceleration of the circulation, pallor of the face, and gentle cuticular horripilation. If, with these symptoms there exists any tumefaction of the absorbent glands in the axilla, they are generally much less equivocal. *On the eleventh day*, the pustule is more and more flattened; it assumes a pearly grey colour tinged with a dirty yellowish hue; the eschar in the centre is blackish, and the liquid it contains is turbid and less viscid.

Upon *the twelfth day* begins the stage of desiccation. The dry crust increases in size at the expense of the rim; the fluid is opaline; the areola hard, but of a less florid hue. From *the twelfth to the fifteenth day*, the pustule becomes quite flat; its fluid is purulent; the desiccation progresses from the centre of the rim towards its edges; the inflammatory girdle subsides, and becomes of a much paler colour. From *the fifteenth to the twenty-fifth day*, the dried crust changes its fawn colour to a dull red, and then to a brown. As the tumefaction is lessened, it projects more from the surface of the skin; the purulent secretion dries, and the epidermis of the neighbouring integument peels off in minute scales. Lastly, about *the twenty-fifth or thirtieth day* falls the scab itself, leaving below it a deep cicatrix, the surface of which is indented by little alveolar depressions. For a long time the scar preserves some intensity of colour, at first a red, and then a bright brown; but, by age, it ultimately assumes the doughy whiteness of adventitious tegumentary tissue.

The virus begins to be formed about the *fourth day*. From that period it is possessed of infecting powers, and is capable of reproducing matter of its own kind; but it is yet in such small quantities as that it cannot easily be made use of, and is moreover, more watery than at a later period. Up to the seventh day it preserves its properties; but from the *seventh to the eighth day, it is most proper either to use or to collect it.* Vaccine matter will often answer which has gone beyond the ninth day. We have ourselves successfully vaccinated with matter seventeen days old; but as these are cases in which the development of the pustule is retarded, more regard must be had to the qualities of the fluid than to the date of the vaccination.

But though the vaccine matter must be allowed to possess reproductive powers capable upon the fourth day of engendering, by inoculation, pustules such as that by which it was itself produced, we are not, *until the period of maturation of the vaccine pustule*,

protected from variolous contagion. Upon this subject the experiments of Dr. Sacco must be considered as conclusive. This skilful investigator vaccinated a certain number of children in one arm upon the same day; then, after a lapse of two days more, inoculated some with the matter of small-pox on the other arm. Those inoculations which he performed before the fifth day were followed by an eruption of variolous pustules, which went through their stages simultaneously with the vaccine pustule; those done upon the sixth or seventh day gave rise merely to a few isolated pustules; inoculation from the eighth to the eleventh day, was followed only by the appearance of a little local pustule, which soon dried away; and lastly, upon sixteen of the children, the inoculation, which was performed from the eleventh to the thirteenth day, was almost wholly without effect.

It is well that the practitioner should be aware that the progress of a vaccination often presents some varieties. The greatest irregularities are observable during the period of incubation. Facts are extant which prove that it may last for a month, and others which assert that it has been succeeded by the period of inflammation at the end of twenty-four or forty-eight hours, the protecting influence and the reproductive faculty remaining unimpaired. In other cases, again, the pustules of a previous vaccination have been seen to break forth at the expiration of a month, under the stimulus of a new operation, which had been judged to be necessary, and run their course along with the pustules of which the latter was productive. Numerous practitioners, moreover, have met with individuals who resisted the influence of the vaccine fluid, and in whom the pustules did not appear until after eight or ten fruitless attempts; which shows the necessity of great perseverance in repeating vaccination in those who have before unsuccessfully been subjected to it. Lastly, the most singular of all these anomalies is one, which though long ago noticed, has been recently confirmed by a great number of facts which came under the observation of M. Treluyer of Nantes. We mean vaccination, the effects of which were manifested merely by general symptoms, without the occurrence of local pustules.

Of Spurious Vaccination.—("*Vaccinella.*" *Rayer. Dis. of Skin.*) Of this, two principal divisions are made. The first is that which shows itself upon a person who has had small-pox, or who has been previously vaccinated. The second is developed upon persons in whom regular vaccination can go on, but which depends on certain

accidental circumstances; for instance, the use of lancets not sharp enough, or which had been oxydized by the virus; the employment of matter after it had assumed a purulent quality, or of that which from age had begun to undergo decomposition, &c.

The progress of the affection, in either case, is remarkable for the extreme acuteness of both the period of incubation and that of inflammation; suppuration being established upon the third day. Thus far they have qualities in common, but in other respects, present very singular differences.

The first variety gives rise to the eruption of rounded, flat pustules, which, on the second day contain a small quantity of limpid fluid, believed by M. Gendrin to be capable of giving the genuine vaccinia. The period of desquamation is extremely tedious, for, although it begins eight days sooner than is usual, it is not complete until the same period under other circumstances, the twenty-fifth or thirtieth day. Lastly, *the cicatrix has no depression*, and it is distinguishable only by the difference of its colour, from the neighbouring integuments.

The second variety, is indeed, also attended with pustules; but the crust or scab falls off upon the fifth or sixth day, and is reproduced and cast off again at various intervals; often leaving behind it an ulceration, which it is difficult to heal.

When either of these affections, which are always benign, is cured, it is necessary to re-vaccinate the patient, who, otherwise, is not protected against variolous contagion.*

We cannot take our leave of the subject of vaccination, without briefly adverting to the anxiety, which, of late years, has existed in the minds of medical practitioners, as to the indefinite duration of the protecting power of cow-pox inoculation. It is a fact that a great number of vaccinated persons were attacked with small-pox, in Scotland in 1818, in Switzerland in 1822, in France in 1825, and at different periods in various other countries. Therefore, vaccination is *not always* a security against contracting variola; but this fact need be productive of no surprise, when it is remembered that it is

* If, however, we are very solicitous to be sure that the vaccination has extended its effects to the system, we may practice Mr. Bryce's test; viz., we may vaccinate the other arm on the 5th or 6th day from the date of the first operation; when, if that has been the case, the affection produced by this second vaccination will be accelerated in its progress, arrive at maturity, and fade at nearly the same time as the affection from the first.—*Trans.*

very possible for a person twice to be attacked with the small-pox itself, and that in very rare cases, several returns of the malady have been experienced by the same individual. Could it then be asked or expected that vaccination should be a better preservative against the small pox, than the small-pox itself? Upon the subject of this very question, however, numerous facts have been re-assembled.* Our limits do not allow us to enter into the necessary details, and we shall merely, therefore, give to the reader the principal results which have been arrived at. It is, indeed, admitted that a vaccinated person may be attacked with variola as well as one who has suffered that disease itself; but then, a few rare cases excepted, the small-pox is discreet, and not only less dangerous than in one who has not been vaccinated, but even very much less so, than when it occurs for the second time in the same person. According to Dr. Thomson, *three* persons died out of *seventy-one*, who, in 1818, were a second time attacked with the small-pox, which is one twenty-fourth of the whole; whereas, out of *four hundred and eighty-four* individuals who had been previously vaccinated, and were also affected with the disease, *one* only perished; whence it would appear, that in those who are predisposed to contract variola for the second time, or oftener, vaccination would be a far better and safer antecedent than the variola itself. A new doubt has, however, been started. Many physicians are of opinion that the action of vaccinia may perhaps be but temporary; so that it would be necessary to re-vaccinate after a certain lapse of time, to secure the person against the contagion of small-pox. The advocates of the latter opinion have engaged in extensive labours, with a view of proving by facts at what period it is that the protecting power of vaccine over the system ceases, but have as yet agreed upon no conclusions. Mr. Goldson, for instance, has fixed the temporary security at three years, whilst M. Geneuil has carried it from twenty to twenty-five years, and other investigators to a lapse of time further from or nearer to one or other of these periods.

Amid opinions so conflicting, each asserted by its promulgator to

* An interesting observation of this nature, is mentioned by Dr. Bateman, in the Med. Chir. Trans. Vol. II, of a patient being attacked with small-pox for the *second time*, contracted from an infant who died; in the apartment were three vaccinated children, all of whom remained free from complaint; "the cow-pock, having, in this case," says the Doctor, "afforded a security which the small-pox itself had failed to produce."—*Trans.*

be based upon facts, what shall we think? To draw any just conclusions, we should be, what no one is, nor as yet perhaps any one can be, sufficiently master of the subject to speak with a knowledge of its cause.

The question at the present day is not, as some inquirers, wilfully blind to the illumination of the age in which they live, would have it, whether or not, in the great majority of persons, vaccination preserves or not, from the contagion of the small-pox; this is a settled point; it does preserve. But it is, whether the protective power is indefinitely exercised, or confined only to a limited period. To this last question time alone can return the answer. Numerous experiments have already been set on foot to decide it. At Geneva, and in Switzerland, for instance, it is becoming a prevalent custom to submit all children to a second vaccination five years after the first is performed; and indeed, it was found, during the late variolic epidemics, that although there were many instances of discreet pustules of variola appearing on those who had only been once vaccinated, no single instance was known in which they appeared on individuals upon whom the operation had a second time been performed; as if the second vaccination had exhausted the capability for variolous infection. Let us hope that ere long an accumulation of facts will dispel all the doubts which now hang over the subject; but, let us, in the meanwhile, repose in vaccination the confidence which it so well deserves, for, even in the most unfavorable solution of the point in dispute, all that would be necessary to make it a perpetual security, would be to submit once again to this very trifling operation.*

OF CATHETERISM.

This name is usually given to the operation of introducing into the urethra, either the instrument called a *catheter*, or a sound, a bougie, or any other substance, the shape and size of which are proportionate to the calibre of that canal. But, owing to the circumstance that the word *catheterism* is expressive of a determinate action, it is beginning to be extended to a similar operation performed on other long narrow passages, such as the œsophagus, nasal canals, outer meatus of the ear, Eustachian tube, &c.; and, inasmuch, as by its etymology it is derived from καθιημι (I plunge,)

* See Appendix, Note VIII.—*Trans.*

there seems to be no reason for confining its acceptation to the urethra exclusively. We therefore, now habitually speak of urethral, nasal, œsophageal and auricular catheterism, and shall ourselves make use of these denominations in the following remarks.

Catheterism has received different names, according to the indications which we purpose to answer by its use. Thus we have *exploring*, *conducting*, *deobstruent*, and *evacuatory* catheterism.

Exploratory catheterism is that whose object it is to ascertain the condition of the sides of a passage, its dilatation, or its partial or complete coarctation; to detect the existence of fistulæ which communicate with its cavity; the presence of tumours, or of foreign bodies, either in the passage itself, or in a cavity beyond it. This exploration is performed with solid or flexible instruments whose forms and lengths of course vary with that of the canal; of this class are sounds, staffs, elastic or metallic bougies, ball probes, &c.

For *Conducting* catheterism, attention is demanded to two very different indications. The first is to supply, by the introduction of a staff, a guide to some other instrument; of this, that upon which the lithotome, gorget or knife slides in lithotomy, is one example; and the instrument upon which, in a fistula lachrymalis, Pamard's spring is introduced, another. Bellocq's sound, for tamponing the nasal fossæ, produces both of these effects simultaneously. The second indication is, to introduce by means of a catheter, a liquid of some kind into a cavity, whether it is to be absorbed thence, like broth from the stomach in cases of stricture of the œsophagus; or to distend or wash out a cavity by clysters and injections.* Of one one or other of these uses, numerous examples are afforded us by the uterus, in passive hæmorrhage; by the bladder, after an operation for stone, or that of lithotrity; by the stomach, in cases of poisoning, and when dysphagia exists; by the urethral, nasal, and Eustachian canals, in the mucous engorgements which result from chronic inflammation of these parts.

Catheterism is called *deobstruent and dilating*, whenever it is put in practice to re-establish the freedom of a canal encroached upon by stricture, or offering impediments of different kinds; such as septa, fungous growths, contractions from cicatrices, &c., &c. The means of dilatation are numerous, and the selection depends

* For some remarks on clysters and injections, see note IX. in the Appendix.—*Trans.*

upon the cause to which is owing the interruption of the canal. If it be a mere tumefaction of the lining mucous membrane of the Eustachian tube and nasal passages, injections will suffice to effect its resolution. A spasmodic stricture seldom requires any thing more for its removal, than to remove the causes which gave rise to it; and is generally cured by the introduction of a bougie. This occurrence is frequent in the urethra. The most various methods of treatment are generally called for by those permanent contractions of calibre, which result from chronic inflammation of the mucous membranes which sheath the natural passages; and here two objects offer: the one to establish the permeability of the canal, and the other to preserve it.

The first of these objects is attained by different means, according to the canal diseased; in the urethra and œsophagus, for instance, by bougies, or hollow catheters: in the nasal passages, a previous incision being needed, the bistoury itself makes its own way. To keep up the perviousness of a canal, and to increase its calibre, two methods are in use; viz., dilatation, and the use of caustic. Dilatation acts by pressing back the parts from within outwards. In the urethra, this is done with catheters and bougies, some of which latter, swell in the centre to be larger than at either end; in the œsophagus, by the use of catheters called *probangs*, which end in some substance capable of enlarging by the imbibition of moisture, such as sponge, orris and gentian root; in the nose, by introducing, after an incision, catheters, setons, catgut or metallic tubes, according to the procedure which is adopted. Caustics produce dilatation in strictured canals by effecting a loss of substance at the constricted spot; but are made use of only in the urethra. The armed bougie of John Hunter was once much employed for their introduction, but the porte-caustics of MM. Lallemand and Ducamp, are now almost exclusively made use of. The caustic to which a preference is given is the nitrate of silver.*

The object of evacuatory catheterism is, as its name imports, to give issue to a contained fluid; almost the only seat of its applica-

* The use of the bougie, in diseases of the urethra, we consider to be quite as worthy of the attention of the surgeon, as that of the catheter; and as it has not been described by the author, we have endeavoured to supply the deficiency in the Appendix. See note X.—*Trans.*

tion is the urinary bladder, in the various cases in which it becomes distended.

URETHRAL CATHETERISM.

Retention of Urine.—It often happens that a surgeon is sent for to introduce the catheter in a person who is unable to pass water. The name of retention of urine is given to this occurrence, which is but a very common effect of divers and multifarious causes. It is said to consist of three degrees. The first is called *dysuria*, difficulty in urination; the water flowing in a small and twisted stream; the second is *strangury*, the water flowing *guttatim*; the third is *ischuria*, in which no urine whatever is passed. Perhaps a more common classification of retention of urine, at the present day, is into *complete* and *incomplete*.

It is not our intention to enter in detail upon the various diseases of which a retention of urine is symptomatic, and we shall proceed merely to point out the method to be pursued in investigating the cause to which it is owing, because a knowledge of the etiology of the disease may shed great light upon the means to be employed in its cure.

Two conditions are necessary in order that a discharge of urine may be effected with facility: contraction of the bladder, and perfect integrity of the canal which lies in front of that viscus, that is, of its neck, the canal of the urethra and of the outer orifice of that passage. It follows from this statement that the causes of retention of urine are all those which bring about a deficiency in the two conditions above laid down, that is to say, non-contractility, or in other words, paralysis of the bladder, on the one side: and on the other, all obstacles to the flow of urine, which the contractions of the bladder, assisted by that of the diaphragm and abdominal muscles, cannot overcome.

M. Boyer has ranked under three heads the causes which act as impediments to the flow of urine. Under the first head he has included foreign bodies accidentally lodged in the bladder, calculi, hydatids, fungous growths, pieces of bougies, catheters, &c. Under the second head are classed diseases or malformations of the organs which excrete the urine. Among these are, inflammations of the neck of the bladder, of the prostate, of the verumontanum, of the urethral mucous membrane; and the septa, fungous excrescences,

and strictures, by which they are followed; urinary calculi, varicose conditions of the prostate gland, cancer of the penis, and the like. Imperforation and narrowness of the canal, or prepuce, are among the malformations. The third class comprises all those diseases which, although foreign to the excretory duct of the bladder, yet compress it and alter its course. Among them are cancer of the rectum, accumulations of fœces or stercoral calculi in its cavity, phlegmon, and divers tumours of the perinæum and scrotum, ligatures around the penis; and lastly, in the female, the pressure of the uterus in the gravid state, or under any diseased condition by which its weight may be augmented, or its direction changed.

Whatever the cause may be which has given rise to an accumulation in the bladder, it may be known, by the following diagnostic signs, to exist. Above the pubis we perceive a resisting tumour, of a rounded shape, and neither hard nor unequal; larger in its vertical than in its transverse diameter; often reaching to and sometimes above the navel. It may easily be felt in perinæo, which it crowds down; pressure on its surface gives no pain, but excites the desire of micturation.

By laying one hand over the hypogastric region and the other upon the perinæum, or else, instead, introducing one finger into the rectum in the male, and into the vagina in the female, and by pressing alternately with one hand towards the other, we can, in a majority of cases, feel either an evident fluctuation, or a sort of undulation. If to these symptoms be added a constant desire to pass water, pain in the loins, along the urethra, and at the glans penis, weight in the perinæum, tenesmus, constipation, numbness of the lower extremities, &c.; if, moreover, we call to mind the antecedent circumstances of the case, and especially the either sudden or progressive suspension of the urinal discharge, its previous occurrence, or the existence of some disease capable of inducing it, not a doubt can remain as to the nature of the malady.

When retention of urine has reached the state which we have now described, the fluid within must indispensably be evacuated, to prevent rupture of the bladder, and the calamities which would thereupon ensue. This is effected by catheterism; or where this becomes impossible, puncturing the bladder must be had recourse to.

It is not for us to speak of the methods of treatment employed for

the cure of diseases which give rise to retention of urine; our object alone is to make known the various ways of emptying the bladder with the catheter.

Catheterism is performed with hollow tubes of small calibre, of a length proportionate to that of the urethra, and which are called *catheters;* some are solid, and others flexible. Solid catheters are made of metal, silver, gold or platinum; they, and the two latter particularly, possess the excellence of being unchangeable, and by the resistance they afford, allow their introduction into the bladder to be assisted by gentle pressure. Flexible, or gum elastic catheters, as they are called, consist of a net-work of flaxen thread, silk, or goats' skin, wrapped round a stylet, and spread with a solution of caoutchouc; their surfaces are smooth and polished, so that they slip along past the sides of the urethra without injuring them. Instruments of this kind, to have been well manufactured, must be extremely elastic, and capable almost of being tied in knots without their coating splitting, or cracking. When we are about to use them, it is customary to pass an iron wire into their cavity, which imparts to them suitable rigidity. Gum elastic catheters are less adapted for a first introduction than metallic ones; but are preferable to them, from their flexibility, when the instrument is to remain for any time in the bladder.

Catheters are of various lengths according to the sex and age of the persons upon whom their introduction is performed. That called "*female*" we described when speaking of dressings, and of the instruments which composed a surgeon's pocket case. Catheters for young children are five or six inches long and one line in diameter; those for the adult male are ten or twelve inches in length, and have a diameter of two lines and a third. Generally, in a sound urethra, large catheters pass more easily than small ones. However, their thickness must vary according as the urethra is of its natural size, or affected with stricture in a greater or less degree. There are some male catheters which are but one line in diameter.

Catheters are described as having a body and two ends. The inner end, or that which enters the bladder, is called the beak. Internally, it terminates in a cul-de-sac; outwardly, it is rounded and smooth, that it may not wound the walls of the canal; on either side, at from two to six lines from the inner end, are two oval holes two lines in extent in their greatest diameter, which allow the urine

to enter the hollow of the tube. The outer end of the catheter, that which the surgeon holds, is called the *pavilion*, owing to its funnel shape; on either side of it are two small rings, by which it can be held whilst between the fingers, and to which strings may be fastened when it is to be left in the bladder.

Until of later years, curved instruments alone had been used for catheterism. To M. Gruithuisen, and subsequently to M. Amussat, we are indebted for the invention of the straight catheter. The curve, in instruments which possess it, generally begins at the inner third of the tube, and describes rather less than a quarter of a circle; the two outer thirds are straight.

We shall not here speak of the S shaped catheter, contrived by J. L. Petit to do away with the inconvenience which a single curved catheter creates, when left for a long while in the bladder, as it has been laid aside since the more commodious invention of the flexible instrument. Upon the subject of the now almost obsolete catheter with a movable point, we shall say nothing, nor shall we proceed to describe the staff, as the ends to which it is applied in operations have no relation to the subject of which it is our business to treat.

The method of performing catheterism is different in the two sexes. In the female nothing can be more simple; but in man, on the contrary, it is an operation which requires extreme delicacy; and if any little obstacle be encountered, it becomes in many cases so exceedingly difficult, that the most skilful surgeons fail of success as completely as the least dexterous. It must not, however, be supposed that because the passing of a catheter is sometimes impossible, there is no benefit to be gained, as some ignorant persons do not hesitate to affirm, in practising its introduction. Far from it; too much familiarity with the performance of this operation cannot be acquired. Such is the difference between surgeons in this respect, that a skilful one will introduce a catheter into the bladder with the greatest ease, in a large majority of cases; and, if under circumstances of the utmost intricacy, he cannot directly succeed in passing it, will wait, and resort to proper measures in the interim; but, except in some few such infrequent cases, will attain his object in less than twenty-four hours, without having inflicted pain upon his patient, nor exposed him to the slightest accident.

On the contrary, place a catheter in the hands of a man who

wants practice in its use, and in the simplest case he will not get it into the bladder until he has put his patient to the greatest torture, and will often force it only by a false passage; and, in cases of difficulty will produce the most dreadful laceration, which will be followed by inflammation of the prostate; by abscess in the cellular tissue between the rectum and bladder; very often by cystitis and by peritonitis; and in short, by a train of formidable symptoms to which a speedy death will inevitably put an end.

Of Catheterism in the Male.

Owing to the difficulties which this operation so frequently presents, two varieties have been founded upon the indication; viz., *simple* catheterism and *forced* catheterism. The simple is employed when there exist no impediments to the progress of the instrument. The forced is used under opposite circumstances; and it then demands certain alterations both in the shape of the instrument, and in the manner of its introduction.

Of Simple Catheterism.

By whatever procedure we propose to effect it, our first business is to make a choice of a catheter; we then besmear it with some fatty matter, butter, cerate, or sweet oil, to make it slip more easily along. If we have chosen to make use of a gum elastic catheter, we do the same to its stylet, and then move it up and down in the hollow of the instrument, to be sure that we shall be able to withdraw it with ease as soon as we have passed the catheter into the bladder. Nor is it less essential, when the catheter is a metallic one, to warm it by friction, or by immersing it beforehand in tepid water. If we neglect this precaution, the cold will cause a spasmodic stricture of the urethra, which may prove an obstacle to the passage of the instrument.

The operation of simple catheterism may be effected in four ways. Three of them require the use of a *curved* instrument; viz., the ordinary procedure, the master-turn, and the procedure of Mr. Abernethy. The fourth procedure is that of M. Amussat, and is done with a *straight* catheter.

The Ordinary Procedure.—The patient is to lie towards the left edge of a bed protected by cloths, his head and chest slightly bent, the pelvis placed horizontally, the thighs apart, and the limbs semiflexed. The surgeon takes his station upon the patient's left side; draws back the prepuce from over the glans penis with the ring and middle fingers of his left hand, their

backs looking downwards; he closes them against the middle of the penis, that the fore-skin may not reascend. His fore-finger and thumb, placed as high as the frenum, seize it, and embrace the penis without compressing the orifice of the urethra. The penis, in this position, looks downwards, so as to form an angle of forty-five degrees with the anterior surface of the body. The right hand, meanwhile, being semi-pronated, grasps the catheter. This instrument is held in such a way as that the convex surface is turned upward, and the concavity downwards. The thumb and fore-finger rest in opposition upon the upper and lower surfaces of the pavilion: the middle finger is stretched forth under the instrument, which it supports, a little in advance of the fore-finger. The catheter is presented to the orifice of the urethra, in the direction of the linea alba, its concavity looking towards the pubis. By a harmony of action between both hands, the operator offers the beak of the catheter to the orifice of the urethra, whilst the penis bends gently forward to receive it, and the instrument is slowly insinuated into the passage. Here again, and with greater unanimity than before, must both hands co-operate in the movement; so that, simultaneously as the right hand approaches the penis to pass in the catheter, the left hand draws up the organ to the instrument. The ends of the catheter describe a trajet of an arc of a circle in opposite directions, which follows the median plane by a sort of see-saw motion performed at its central point; so that the pavilion rises as the beak descends. When the surgeon has conducted the beak to the arch of the pubis, he lets go the penis, and gently and slowly raises the top of the catheter to a perpendicular, without the exercise of the slightest pressure; then, raising the instrument for two lines at the utmost to disentangle the beak from the folds which are caused by a wrinkling of the mucous membrane of the urethra, he, by a movement which describes the fourth of a circle in an inverse direction to the first, his hand being thereby placed in a state of pronation which increases by degrees, whilst at the same time he presses gently upon the catheter, lowers its pavilion between the thighs of the patient. The beak, from the little see-saw motion which is given it, slips along the anterior and upper surface of the urethra, beneath the arch of the pubis, and enters the bladder of urine. Of this fact we are at once apprized, not merely by an abundant flow of urine through the tube, but by a

want of resistance to the point of the catheter, by the depth to which it has entered, and above all, by the ease with which lateral motion can be given to the beak of the instrument, by rotating the pavilion upon its own axis.

In the performance of this manipulation, the exercise of the *utmost gentleness* can never be sufficiently commended. If at any point we encounter resistance, which is generally in the membranous part of the urethra, which forms a cul-de-sac in front of the beak, we are by no means to strive to overcome it by force, but, on the contrary, to endeavour to avoid it. This may almost always be effected by raising the instrument a little, by withdrawing it for a few lines, and then re-introducing it, by modifying its direction, or else by giving to the catheter, whilst it presses against the impediment, slight rotatory movements similar to those of a drill, so as to turn aside the projection or the wrinkle which resists. If all the attempts of this kind are ineffectual, we are to pass our left hand under the perinæum, to ascertain the place at which the catheter is stopped, to exercise friction, and by raising it with the fingers, direct its point through the prostate gland; but if the beak of the instrument having passed beyond the perinæum, has reached the prostate or the neck of the bladder, we are to introduce the fore-finger, previously oiled or greased, into the rectum, and after we have disengaged the point, we direct its progression in such a way as to make it clear the cervix vesicæ, and pass into the bladder.

The "Master Turn."—Of this procedure, which now, as a general method at least, has fallen into disuse, we shall say but little. The patient lying in the position above described, the surgeon either stands on one side of him, or between his thighs, and presents the catheter in an opposite direction to that given in the previous manner of introducing it; that is to say, the pavilion of the catheter is between the person's thighs, and its convexity looks towards the abdomen and pubis. When the beak comes underneath the arch of the pubis, the surgeon causes the pavilion of the catheter, and consequently the penis, to describe a semicircular movement, bringing the instrument up towards the left groin and in front of the abdomen; then, depressing it between the thighs, as in the simple procedure, it passes into the bladder.

The master turn consists, in fact, of two semicircular motions, the one horizontal, from the space between the thighs to the umbilicus; the other vertical, from the umbilicus towards the same

inter-femoral space. The first motion is given in a direction inverse to the beak of the catheter, and its effect is to slip it above the folds which there are in the posterior surface of the mucous membrane of the urethra; but to succeed properly, it requires to be very quickly performed, and may therefore either distend the canal or injure it. The second motion passes the instrument into the bladder; and is the same as that which terminates the first described procedure.

This method of introducing the catheter, which has been condemned by all practitioners, and particularly by such men as J. L. Petit and M. Boyer, nevertheless afforded some facilities in the first introduction of the curved instrument into the penis of very fat persons, whose very protuberant abdomens acted as impediments to its being done in the usual manner. In the only cases in which it can be at all called for, the method of Mr. Abernethy, which is much more convenient and unattended with danger, ought always to be substituted for it.

The *Procedure of Mr. Abernethy.*—The patient lies upon a bed, his pelvis drawn towards its edge, his legs depending, and his thighs apart as if it were intended to operate upon him for stone; the surgeon takes his station in the separation between the lower limbs, seizes the penis between the middle and ring fingers, of his left hand, its back being turned downwards. The prepuce is drawn back, in the way described in the first procedure, the glans being held between the fore-finger and thumb. Then, with his right hand, the surgeon offers the catheter in the way which is done in performing the master turn, i. e. with the pavilion turned towards himself, and the convexity towards the abdomen of the patient. Lowering the penis upon the scrotum, the operator passes the beak into the canal of the urethra; then he raises the penis to an angle of forty-five degrees with the anterior plane of the body; and, as the instrument penetrates, slides the penis gently over it. When the arch of the pubis is arrived at, he places the penis circularly upon the catheter, and lowers them together between the patient's thighs, the pavilion being turned directly backward, that is to say, forming an angle of eighty or ninety degrees with the anterior surface: the beak being thus engaged beneath the pubis, he pushes it to make it follow the upper and anterior surface of the urethra, and passes it with ease into the bladder. When the instrument has attained this cavity, it is raised up by the master turn; which is now effected without any danger. The method of Mr. Abernethy is very expe-

ditious, and offers the two-fold advantage of easily avoiding the various impediments which are presented by the verumontanum, and membranous part of the urethra at its posterior and lower surface, and of enabling us to perform catheterism, as the master turn does, with as much ease in a corpulent subject as in a thin one.

The *Procedure of M. Amussat.*—This, as we before stated, is performed by means of a perfectly straight catheter. It is founded upon the fact, for a knowledge of which we are indebted to M. Amussat, that when the penis is held perpendicularly to the anterior surface of the body, the direction of the urethral canal in its entire length is evidently a straight one. No operation for catheterism is so simple or so speedy as this. The penis being held between the thumb and fore-finger of the left hand, in the direction just indicated, the instrument is offered to it with the right hand, and insinuated into the canal; then, stretching the penis, we slide it directly under the pubis, and into the bladder, without the least difficulty. However, in some cases, in which the neck of the bladder rises a little higher than usual behind the pubis, a slight difficulty may at first be experienced; but all that is then necessary is gently to lower the pavilion of the catheter, using the pubis for a fulcrum, to cause the beak of the instrument to clear, as it were of itself, the neck of the bladder.

This operation of M. Amussat is really a triumph in modern surgery, and we earnestly recommend to all young surgeons to exercise themselves frequently in passing the catheter in this way, as it may offer a very great resource in practice. We can, for our own parts, assert, that in many cases, not of stricture, it is true, but in which false passages existed, wherein we had found a difficulty in introducing the common curved instrument into the bladder, we have never failed, in the use of the straight one, easily to avoid the projection which the false passage formed, and to pass the instrument with all customary facility into that organ.

Of Forced Catheterism.

This method of catheterism is made use of in cases wherein there exist obstacles which oppose the introduction of the instrument into the bladder, in order that the necessity for resorting to its puncture may be avoided. It is done by two methods, one of which is that of M. Boyer, and the other that of M. Dupuytren.

Procedure of M. Boyer.—The object of its author is, as he says, "to force an artificial route along the natural one, or, in other

words, in a manner to puncture the urethra itself." The instrument which he uses for the purpose, is called the *conical catheter*, because of its ending in a point. Internally its calibre is completely filled up by a stylet, the addition of which greatly increases its solidity.

The method of performing the operation is not different from the usual one, until the period when the catheter reaches the impediment, and can advance no further. The following steps are then taken:—Having by the usual process arrived at the obstacle, the surgeon passes his left fore-finger, well greased, to a great distance into the rectum. With his right hand he holds the pavilion of the catheter, between the thumb and the radial edge of the fore-finger in a state of semiflexion, and pushes back the penis on the catheter to make the latter advance; the prehension of that organ is facilitated by wrapping it in a piece of linen, which prevents the fingers from slipping. Then, by pressing upon the catheter with a force proportionate to the resistance to be overcome, he urges it onwards in the known course of the urethra, carefully avoiding any inclination to either side. During this manipulation, the fore-finger, which is in the rectum, does the office of a sentient director for the catheter, guides its progress, and replaces it, if it diverge, in the direction it ought to pursue. The operator perseveres in this way until he presumes that the instrument has entered the bladder, of which he is made aware by the ease with which he can depress the pavilion; he then draws out the stylet, and the urine flows, proving the success of the operation. To allow the urine to pass out freely from the bladder by the eyes of the instrument, it is passed a little further in, but for a few lines only, lest its point should injure the side of the viscus opposite to it.

Such in substance is M. Boyer's procedure; and upon this mode of catheterism, very different sentiments have been expressed. It is admitted by its inventor that it does not always succeed the first time; that it is difficult of execution, and requires great practice and dexterity; but he asserts that he has very frequently derived from it the greatest benefits. Many operators, on the other hand, affirm that it is constantly liable to create false passages, and look upon it only as a means of puncturing the bladder, and the most dangerous of them all. It does not become us to express our own opinion on this subject; we merely suggest that it is one which

should not be attempted by any, who, to great skilfulness, do not unite an accurate anatomical knowledge of the parts through which the instrument is to pass. We have spoken of this very delicate operation, which must remain the exclusive property of great surgeons, not to recommend it to be attempted by the inexperienced, but because we have thought it our duty to mention it among the different ways of performing catheterism.*

The Procedure of M. Dupuytren.—This, which is much milder than the preceding, and extremely easy to perform, is, however, only applicable in cases in which the necessity for evacuating the bladder is not urgent. The inventor is usually in the habit of using a gum elastic bougie; but a catheter will do equally well. It is passed gently in as far as the obstacle, and, without the exertion of any pressure, is fastened in contact with it. A mucoid secretion, caused by the presence of this foreign body, is soon perceived to exude; the effect of this is a yielding of the tissues which constitute the impediment, and a small cavity forms in front of the instrument. This is then pushed still further forward, and again fastened to await a similar result. In this way, the permeability of the canal will generally in twenty-four or thirty-six hours be re-established. As soon as this is effected, the instrument, if a catheter, is passed on into the bladder; if a bougie, it is withdrawn, and the catheter instantly substituted for it.

Of the Evacuation of Urine.—By whatever procedure the bladder has been entered, the urine directly flows out through the eyes in the end of the catheter. Whilst the discharge continues, the surgeon holds the catheter horizontally by its pavilion between

* Forced catheterism should be attempted by no one, who is not so sure of his hand and of his anatomical knowledge, as not to fear passing the instrument into the adjacent parts, in its passage through the perinæum. It is oftener than any other mode of catheterism, the cause of the production of a false passage; and, according to M. Velpeau (Méd. Operat.), Mons. Roux, himself, has more than once proved its danger, by the death of his patients. The conclusion to which M. V. has arrived is, that between it and puncture of the bladder, there is little difference. Still more emphatic is Mr. S. Cooper. "It is," says he, "an operation by which young men of little caution and no experience, may do more harm in the first few cases they meet with, than the rest of their lives will afford them opportunities of doing good." Most modern surgeons, indeed, discourage its performance, although they do not condemn its occasional use. —*Trans.*

the thumb and middle finger of the left hand, to prevent it from rising, or from being expelled from the bladder by its contractions. We receive the urine in some vessel, small enough to go without difficulty between the thighs of the patient, and flat, to allow of the depression of the instrument. Each time that this vessel is full, the surgeon stops the flow by placing his fore-finger over the orifice of the catheter; an assistant empties the small vessel into one of larger dimensions, and it is then filled a second time. As the bladder empties, we must aid in the expulsion of the liquid by pressure with the hand. Sometimes the same precaution is necessary at the beginning of the operation, when the retention of urine has originally been owing to a paralysis of the bladder, or when the organ has, by over-distension, or the long continuance of its state of repletion, lost its elasticity and power of contraction for a time only. The discharge of urine is much facilitated by exerting a slow pressure upon the hypogastric region, with the dorsal surface of the right hand semiflxed, which is increased gradually as the evacuation proceeds. Here, as in all cases in which issue is given to a collection of fluids, the flow sometimes suddenly stops. In the bladder, this occurrence is most commonly owing to the adhesion of thick mucous around the beak of the catheter, which blocks up the eyes. At other times again, clots of blood, gravel, or a thick sediment mixed with mucus interrupt the stream, or lastly, the same result is produced by an adhesion of the mucous membrane of the bladder itself to the eyes of the instrument when it is too much raised; or by the membrane forming folds, as the evacuation verges towards a close. In the event of the stoppage being owing to the first of the above causes, we are to endeavour to clear the openings in the catheter by introducing the stylet into its cavity, after affixing some fibres of lint to the end of it; or else a gentle lateral motion is communicated to the pavilion, and oscillations, with a view to wash out the obstruction from the eyes by the undulations of the fluid within. If these means do not succeed, a sudden injection into the catheter of a few drops of tepid water, by means of a quick stroke with the piston of a syringe, whose pipe passes into its outer orifice, will almost always answer the end. Lastly, supposing the beak of the catheter to be blocked up by the mucous vesical membrane, all that is necessary to enable the remaining fluid to pass off, is, to withdraw it for a few lines. This last step, indeed, should always be pursued, when the discharge is about to cease, to avoid the irrita-

tion which would result to the walls of the bladder from the friction of the beak of the catheter.

The quantity of urine which is drawn off in this way varies according to a number of circumstances, the chief of which depend on the size of the bladder from the age of the person, from his previous habits of frequently passing, or retaining his water for a long time, the number of times that he has been affected with retention, and finally, the period which has elapsed from the last voiding of the bladder up to the time when the catheterism is performed. In common cases, three or six pounds of urine are obtained; but cases are recorded, in which at one discharge twenty, thirty, and even a much greater number of *kilogrammes* of this fluid have been evacuated. Owing to the absorption of its watery part, the colour of the urine is of a deeper red, and its density so much the greater, according to the time the patient has remained unrelieved before the operation. Again, towards the conclusion of the discharge, it is sometimes very difficult to obtain the expulsion of the thick sediment which is deposited at the bottom of the bladder, and indeed, it is prudent, when the quantity seems to be very considerable, to inject a quantity of warm water through the catheter, which either dissolves it or brings along with it the greater portion, The whole of the urine which the bladder contained being now drawn off, we are, according to the case, either to withdraw the catheter, or to fasten it so that it may remain in. When the urethra is sound enough for us to believe that we can easily reintroduce the catheter if the desire to urinate should be felt anew, we may adopt the first of these courses with impunity; but, when stricture, or any obstacle exists which there has been difficulty in overcoming, prudence warns us to allow the instrument to remain behind in the bladder. A gum elastic catheter, owing to its flexibility, and to its not encrusting with calculous matter as speedily, is in this case, much preferable to a silver one. There are many contrivances for fastening in this instrument; and that which we have found to be the most convenient we shall now describe.

*The Contentive Apparatus of the Catheter.**—It consists of two rings and four strips of caoutchouc, and should be made expressly

* The necessity of an appparatus of this kind, for guarding against the escape of a bougie or catheter, if left in, into the bladder, is very great. It may not, at first sight, appear how an instrument 10 or 12 inches long, can pass wholly into the reservoir of urine; nevertheless, that it does so is incon-

for the patient by whom it is to be worn. It is a very easy thing oneself to cut out and make this little bandage. Of the two rings, one is made of a strip whose two ends come together in a circle and are properly sewn, and should be of diameter sufficient to receive the penis; the other, having only to give passage to the catheter, must be so small as that that instrument can only enter by distending it, so that, when it returns to its natural shape, it compresses the catheter circularly. Lastly, the strips, which are half the length of the penis, are cut into strings of the diameter of a line and a half, and must be sewn upon the largest ring at each end of of two diameters where they cross each other at right angles.

To use this apparatus, we have the catheter in the bladder, but only at a depth of eight or ten lines; we then pass its point, and subsequently the glans penis, into the large ring, and then slip it over the penis itself. We then pass the pavilion of the catheter through the small ring, and let it project for eight or ten lines; and carrying up the four little strips in front of the small ring, we fasten them there by a piece of silk which is wound circularly over them around the catheter. Owing to the elasticity of the caoutchouc, this is a very convenient contrivance; it elongates in the erections of the penis, to which the irritation caused by the presence of the catheter often gives rise, and returns again upon itself as the penis returns to its wonted flaccidity. For the same reason, the large ring is likewise capable of forming either a larger or smaller circle. It is not, however, uncommon in persons the size of whose penis is very much increased during erection, for the ring which surrounds that organ not suitably to perform its office, from the impossibility of its accommodating itself equally well to either condition of the part. It must then be enlarged, or what is still better, a hoop of proper size must be substituted for it, which is to be made of an iron wire, around which a string has been wreathed; and which is prevented from slipping up towards the glans by four little cords which are attached to a belt, two small ones above the groins in front, and two long ones behind, passing under the fold of the thighs. In case we have no caoutchouc at command, we must substitute cotton wick for it, which is to be tied in like manner upon the catheter, but it is easy

testable. Mr. Cooper mentions the loss of a female catheter during its passage; and M. Velpeau, in his new elements of Operative Medicine, mentions that an operation for cystotomy had been performed by M. Roux for that very cause.—*Trans.*

to perceive that such inelastic ligatures can but imperfectly replace it.*

When the apparatus has thus been adapted to the retention of the catheter, we close the orifice of that instrument with a plug, which we remove when the urine is to be evacuated, leaving generally an interval of two or three hours between each period, but in every case proportioning the time to the activity of the secretion; for it is always a rule not to allow the fluid to accumulate in too large a quantity, that the bladder may gradually resume the elastic tension which it had lost by its recent over-distension. In eight, or at most ten days, we remove the catheter to change it, or to clean it at least, for by this time it has generally become encrusted with the different solid materials precipitated from the urine. Were we to delay longer, the concretion would be sufficiently irregular to lacerate the mucous membrane of the neck of the bladder and urethra, on our attempting to withdraw it.

To conclude, if the case wherein the catheterism has been employed requires a longer continuance of the use of the instrument, we must introduce it anew and fasten it again as before; but in that case, before it is withdrawn, we should select a moment when the bladder is full of water, that the point of the catheter, as it passes in, may not come in contact with its parietes.

Of Catheterism in the Female.

The woman lying horizontally upon her back, the pelvis elevated, the thighs separated and slightly flexed, the surgeon, standing at her right side, puts asunder the nymphæ with the left thumb and

* The wick apparatus mentioned in the text, is made in the following way. We take two cotton wicks, each half a yard long; make a ring or loop in the middle of each; place and tighten each upon the catheter, some lines from the glans, so that the four ends may hang separate. The surgeon then takes the two ends of the first wick, adjusts them, approximates them, passes the one into the other so as to form a loop at an inch or two from the seat of the attachment to the catheter; applies this loop against the penis; passes the ends around, crosses them, brings them back to the same side again, and ties them in a bow. Next, he does the same with the other two ends; and thus, we have four equally tense strings, supple and not slippery, having the catheter for their starting point, and the penis for their base. *See Velpeau's Méd. Op. Vol. III.* A catheter fastened in this way, should not enter the bladder for more than an inch or two, as it might ulcerate and even perforate it, of which many instances exist.—*Trans.*

middle finger. Unless any difficulty in the case should render exposure necessary, and compel him to see what he is about, out of respect for the feelings of the patient, he must make use of the touch merely to direct the catheter, the fore-finger being almost always sufficient to point out the situation of the meatus. This orifice is indicated by a projection situated below the clitoris, sensibly perceptible to the feel, and in the triangular space which is bounded below by the upper outline of the vagina, and by the labia minora on either side. When he has detected the position of the orifice of the urethra, the surgeon insinuates into that canal the catheter, holding it in his right hand, with its concavity towards the pubis, his left fore-finger acting as a guide; he has then only to lower the pavilion of the instrument a little, and push it forward into the bladder.

Notwithstanding the extreme ease with which this little operation can usually be accomplished, some circumstances may cause us to fail, and therefore we should be aware of them. The position of the meatus is not in all women precisely the same. In young women, particularly if they are virgins, it is situated a little more forwards and rather higher up; as women, on the contrary, advance in age, it is situated lower and more posteriorly. The latter distribution of the part is very remarkable in the latter months of pregnancy, so much so, that in some cases, the meatus will be found at the upper and fore part of the vagina. Lastly, the mucous lacunæ which exist around the orifice of the urethra, may occasionally be mistaken for the urethra itself. The pain which the patient suffers from the wrong direction of the instrument, will warn us of this occurrence; we must then alter its situation by a sort of rotatory movement, and the catheter will pass of itself into the canal.*

We shall not attempt any description of the introduction of an instrument into the Eustachian tube, which is not only extremely difficult of execution, but of very doubtful utility; nor of the different methods of catheterizing the nasal passages; these are operations never of an urgent nature, and they constitute, moreover, parts of operative procedures in the consideration of which it is not for us to engage.

We shall say a few words upon the subject of

Œsophageal Catheterism.

The cases in which this operation is required to be performed

* See note XI. in the Appendix.—*Trans.*

are two-fold. Either it is requisite to overcome a stricture somewhere in the œsophagus, to admit of the passage of liquid aliment into the stomach; or else, the canal being sound, and deglutition or emesis nevertheless difficult, our object is either to introduce liquids or substances of a pulpy consistence into the stomach, or else to pump out thence such as are contained within it. Poisoning furnishes us an example of the one object, and indigestion of the other.

Œsophageal catheters and bougies* are of dimensions suitable to that of the canal through which they are to pass. Their usual length is two feet and a half, and their diameter from four lines to six. Generally they are made of gum elastic, and resemble the instruments for the urethra, that is to say, they have one larger open end, and the other ends in a cul-de-sac, with two wide lateral apertures. However, the construction is altered to suit the particular indication to be fulfilled. Thus, for passing through a free œsophagus, a mere gum elastic catheter is used. A funnel made of boiled leather is affixed to its upper end, to facilitate the introduction of liquids into its cavity. If any slight impediment is to be apprehended, a stylet made of wood should be added to the catheter, or what is better, a whalebone one, as this material is at the same time less fragile and more elastic. If the obstacle to be overcome is one which presents a very great resistance, a silver œsophageal tube must be made use of. M. Boyer has himself found it necessary to resort to this means, which he did with complete success. Lastly, when it is intended to perform injections into the cavity of the stomach, or to extract from it, the pipe of a syringe is adapted to its outer extremity, which answers for a sucking or forcing pump, as the case may be. The common syringe will generally be sufficient. The pipe is unscrewed, passed into the top of the catheter, and the two instruments are brought closely into contact, by being wound round with a strong waxed thread or silk.†

* Dr. H. G. Jameson, of Baltimore, has found great advantage in using *ivory* probangs, extremely smooth, firmly screwed upon a slender whalebone rod, and of different dimensions; which he directs by means of a ball probe. *Am. Med. Recorder, Jan.* 1825.—*Trans.*

† For this purpose, a very beautiful, but complicated instrument, has been perfected by Mr. P. Rose, a cutler of New York, by which fluids may be injected and withdrawn alternately, by a rotatory lateral motion of the barrel of

An instrument is passed down the œsophagus by one of two methods; either by the nose, or by the mouth.

By the Nose.—In this case the stylet is always left out. The patient either sits up in a chair or in bed, his neck is put upon the stretch to diminish the angle which the axis of the inferior meatus makes with that of the pharynx; the inner end of the catheter is then passed into the widest nostril.

In order to get it through the nasal fossa, we give the catheter a rotatory drill-like motion between the fingers, and lean it towards the septum nasi to prevent the beak being stopped by the turbinated bones. When the instrument in the pharynx has reached its posterior wall, the patient is directed to open his mouth very wide; and passing the catheter on all the while with the left hand, we seize its point with the tips of the fore and middle fingers of the right hand; and give it a direction downward, backward, and very slightly towards the *left* side, in the direction of the œsophagus. But for the exercise of this precaution, the beak of the instrument might pass, by the opening of the glottis, into the pharynx; and against the possibility of such an occurrence we ought always to be upon our guard. When the catheter gets into the œsophagus, we continue to pass it slowly on until it gets into the stomach. Of its entrance into that viscus, we are made aware by the sensation of having overcome some resistance at the cardiac orifice; but, should this characteristic chance to fail, we may, owing to a certain resistance which is experienced, by the pain felt by the patient in the right hypochondrium when pressure is made upon the instrument, and lastly, by the depth to which the tube has passed, be assured that the catheter is in contact with the greater curvature of the stomach, and must then pull it forth for an inch or two.

the pump. Mr. Read has contrived another, and a Dr. Matthews, of Philadelphia, is the discoverer of a third. The best and most recent of these instruments are equally adapted to the injection of the stomach, rectum, and the veins. They, however, are expensive, and not within the reach of all; and we have the high authority of Professor Gibson for saying, that from comparative trials, he prefers a simple instrument, like that described in the text, to those above mentioned. *Ins. and Prac. Surg.*, *Vol. II.*, *p.* 276. A quantity of water, *not too hot*, should be injected. This water, mixed with the contents of the stomach, must be immediately withdrawn, and a fresh supply thrown in; and thus, by alternate injection and evacuation, the poison may be extracted, and the patient saved. Mr. Read is also the inventor of a syringe of similar character for the performance of transfusion.—*Trans.*

The introduction of an instrument through the nose into the œsophagus is both quick and easy. In every case in which that passage is unobstructed, or in those wherein the stricture is not so great as that it cannot be overcome by the pressure of a catheter unarmed with a stylet, it is proper to practise it.

When deglutition is difficult or impossible, and the catheterism has been performed to nourish the patient artificially, the instrument must be allowed to remain in. The T bandage from the nose serves to secure it outwardly; it is fastened to the outer end of the catheter by a few stitches which pass through its sides without crossing its cavity. This constitutes a very convenient apparatus for injecting broth, pure, or mixed with farinaceous articles, into the stomach. From the permanency of the instrument, we may at pleasure repeat the ingestion of aliment, every time that the patient experiences the sensation of hunger.

By the Mouth.—In consequence of the axis of the mouth making almost a straight line with that of the pharynx and œsophagus when the head is thrown back, we may perform this operation with an inflexible catheter. For this reason it should be preferred to that by the nose, when the cause of the stricture is of such a nature as to offer considerable resistance. The patient is to be placed opposite a window, in the same position as that we have described in the foregoing procedure; his mouth is to be widely opened that the isthmus of the fauces may be distinctly visible, and his tongue put down with the fore and middle fingers of the right hand; then, with the left hand we pass in the bougie, or the catheter armed with its stylet. During this process, the patient almost always experiences convulsive movement of elevation of the velum pendulum palati, and a disposition to vomit, from the irritation about the part. We must pause for a while, until these efforts are allayed. As soon as we can resume the operation, we avoid with great caution, as before described, the introduction of the catheter into the larynx, and continue to pass it slowly along the œsophagus down to the seat of stricture. Having arrived at this point, we redouble our care not to wound the always delicate and often softened walls of the œsophageal passage. Should we meet with resistance, we must endeavour to conquer it with the utmost gentleness, by moving the instrument in various directions, and by impressing upon it slight motions of rotation on its own axis. Thus we gradually proceed, and ultimately clear the obstacle. If the resistance should directly be felt

to be very obstinate, it is better to wait for a few moments and allow the parts to become familiar with the contact of the instrument; and then pursue our efforts as before. It is very seldom that we cannot, after a few trials of this kind, succeed in getting through the stricture. When this is accomplished, and the instrument is in the stomach, we draw out the stylet and proceed to act as was formerly described.

We may also allow a catheter to remain in the œsophagus, which has been introduced by the mouth; but a new difficulty then presents itself; which is, how to bring its external end out through the nose. This, however may be effected by passing, by means of what is called Bellocq's catheter or sound,* a silken thread, waxed and doubled from the fossæ nasaliæ into the mouth. The catheter being in the œsophagus, we tie the end of the waxed silk firmly upon the projecting end, and place it in the pharynx. Then, by pulling upon the nasal end of the silk, the pavilion of the catheter is drawn backwards, then above the velum palati, directing its motions with the fore and middle fingers of the right hand in the isthmus of the fauces. Finally, by pulling upon the string, and keeping close to the septum, we succeed in getting the end of the catheter out at the nostril and there fasten it as aforesaid.

Œsophageal catheterism is of the greatest utility. Besides admitting of the artificial nutrition mentioned, it is indispensable in every case of poisoning in which emesis cannot be produced. Through the catheter we may inject various substances capable of neutralizing the poison, which may successively be pumped up to allow of the introduction of others.† The stomach has often been emptied in this way in cases of surfeit, but the catheter must then be

* A silver tube, open at both ends, into which is received a probe pointed silver stylet, pierced with an eye, the curve of which stylet is such, that when the tube has descended to the back part of the nasal fossa, it turns round, under the velum palati, up into the mouth, where it offers its point and its eye for the reception of the doubled thread, to which the tampon in some cases, and the catheter in this, is attached. It is then redrawn into the tube, carrying the thread with it into the nose from behind forwards.—*Trans.*

† The use of the syringe and catheter will generally be found to be most indicated in cases of poisoning, in which emetics fail of their effect; or in those in which vegetable *narcotics*, particularly opium, or *alcohol* in a large quantity, has been taken; in which the effect on the nervous system is so overpowering as to destroy completely the sensibility of the stomach and brain. Under these circumstances, the offending agent cannot be too quickly removed.—*Trans.*

very long, and its eyes of large dimensions. Although in these cases, we cannot always remove all the aliment which is unchymefied, we can at least extract a very considerable part, by previously liluting it with warm water or emollient decoctions.

Generally it is easy of execution, but always demands the exercise of the greatest care. The consequences of a perforation, which it would be easy to create by violent pressure with a lever of two feet and a half in length upon the fungous parietes of the gullet, softened by an encephaloid cancer, it would be easy to conceive. Nor would the danger be lessened in a case of stricture, which depended not upon organic disease of the œsophagus itself, but was owing to an adhesion of its sides from the pressure of a tumour in the adjacent parts, or of an aneurism of the aorta particularly. Lastly, we cannot say enough by way of caution aginst the possibility of an introduction of the catheter into the *larynx*. It is not to be supposed that the occurrence of this event is always to be detected by the symptoms of suffocation which it might be expected to produce. They are sometimes wanting. One fact of this kind only we shall quote, but that one is conclusive, since it occurred to as great a surgeon as France has ever produced. Desault, thinking that he had passed his catheter into the œsophagus, proceeded to make an injection of broth; suffocation ensued, and demonstrated that the bronchia were filled with the liquid, and that consequently the *instrument was in the trachea instead*. But no difficulty in the respiration, before the injection was made, had pointed out, or given rise to a suspicion, that the catheter was anywhere but in the passage through which it ought to have passed.*

OF THE REDUCTION OF HERNIÆ.

By the general name of hernia is understood the exit of one or of several parts through a natural or accidental aperture of the surrounding tissues; whence it follows, that all parts which lie deep

* Dysphagia which demands the use of catheters or bougies, is either spasmodic, or the result of paralysis, organic disease, and tumours in the vicinity. The seat of stricture generally is about the cricoid cartilage of the larynx, where the œsophagus begins. If a bougie passes to a depth of eight inches from the edge of the teeth in the upper jaw, it may be supposed to have exceeded that distance. The great art in passing an *instrument of any kind* into the œsophagus, is to put its extremity at once against the posterior part of the pharynx, and to keep it closely against the vertebræ, so as to avoid the epiglottis. (See Append. Note XII.)—*Trans.*

may protrude through their coverings, or the walls of the cavities in which they are contained. We have, accordingly, hernia of the brain, lungs, abdominal and pelvic viscera, muscles, &c. Nevertheless, a hernia in its usual acceptation, means generally the protrusion of the abdominal *intestines with or without omentum*, through one of the three rings or great natural orifices of the belly; viz., the umbilicus, the abdominal ring and the crural ring.*

Reduction is that process by which the displaced bowels are made to resume their natural situation. For effecting this object there exist a great many means. The chief, the surest, and the most speedy is the *taxis*. By this word is meant the combination of motions made with the hand, whereby the viscera are compelled to re-enter their natural cavity. When the taxis cannot be made to succeed, we are, *before we resort to it for the second time*, to make trial of various means very different in their modus agendi. First; some of them act by lessening the inflammatory congestion, and consequently, the size of the displaced parts; among these are bleeding, leeching, emollient poultices, baths, &c. Secondly; others aid in the reduction by producing relaxation in the muscular tissues; of which class are the narcotics. Thirdly; others again act by increasing the contractility or retraction of the tissues; cold applications of water or pounded ice, and astringents, from the constrictions which they cause, are among their number. Fourthly, and lastly; it very often happens that these means fail of any effect, because the parts are powerfully strictured, either at the aperture through which they issued, or at any other point. This occurrence is called *strangulation*. In order to relieve it, it becomes necessary to cut through the integuments and coverings of the hernia, and when the viscera have been exposed, to divide the stricture in the spot at which it makes the pressure, that we may be enabled afterwards to return the part without danger. It is the assemblage of these actions to which the appellation of *the operation for strangulated hernia*, is given. It is our business only to consider the measures which precede this final resort, and the object of which is to dispense with the necessity for it.

We cannot in this place enter upon a detail of the different seats

* The brain, lungs, bladder, ovaries, uterus, fallopian tubes, spleen, liver, and stomach, one or more, have been known to protrude, or be contained in hernial sacs. The intestines which descend are, the jejunum, ileum, cæcum and its appendix, colon, and the omentum.—*Trans.*

in which herniæ occur; of the causes to which they are owing; of the mechanism of their formation; of the diverse displacements of parts which may contribute to their existence; of the diagnostic marks by which such or such viscera may be known to be contained in the tumour; of the changes which the tissues, under the influence of different causes may after a time undergo; of the complication of herniæ; or of the occurrences to which they give rise, &c.; all of these are circumstances that particularly belong to the history of the disease, but to enumerate which, would merely be too greatly to exceed our limits. As it is impossible to extend this subject to a suitable degree, we shall be content with first briefly recapitulating, among the more essential facts connected with the pathology of hernia, whatever must absolutely be known to enable the learner to comprehend the method of its reduction, after which we shall describe the method of performing it.

Of the General Points of Hernia.—Abdominal hernia is divided into three principal classes: *inguinal*, *crural* and *umbilical*. It will be seen that these names have reference to the foramina whence it issues. The most common of all is inguinal hernia; and is almost exclusively met with in the male. Crural hernia, on the contrary, is most common in the female. According to M. Jules Cloquet, the frequency of these herniæ is as three is to one; whence it follows that males are much more liable to hernia than females.* Umbilical hernia, the least often seen of the three, is a disease of infancy, rather than of any other age. It is less common to men than to women; and in them also we see almost exclusively *ventral* hernia of the linea alba. The rarer kinds of herniæ, named from their points of protrusion, *diaphragmatic*, *ovalar*, *ischiatic*, *perineal* and *vaginal*, we shall pass over in silence. Hernia occurs almost always after great muscular exertions; whence it follows, that they are most liable to become the subjects of this disease, who are engaged in toilsome and laborious occupations. Except the pancreas and kidnies, all the abdominal viscera have been known to form a part of abdominal herniæ; but all are not, however, displaced with equal facility. The omentum, the duodenum, jejunum and ileum, escape the most readily; next come the cæcum, arch of the colon

* Women are but seldom the subjects of hernia. It is stated by M. Edwards, in his Manual of surgical anatomy, that out of 4,070 who applied for relief for reducible herniæ, at the City of London Truss Society's Office, 34 only were females, and all the rest males.—*Trans.*

and iliac colon; then the bladder, stomach, uterus and ovaria. Herniæ of the spleen and liver are very rare indeed.

The viscera, generally, which protrude, do so in such herniæ as occur near to the place of their natural situation. The duodenum, jejunum and ileum, and the omentum, are thus almost always seen in the three large herniæ; the stomach would be likely to enter into a hernia of the umbilicus, and the bladder into a crural or inguinal one. In a very few uncommon cases, however, certain viscera have been found contained in hernial protrusions, at a great distance from their normal location, as for example, the cæcum in an inguinal hernia of the left side.

When the viscera come out from the abdomen, they push the peritoneum before them, and make of it for themselves a primary envelope or covering, which is called the *hernial sac.* All viscera which are completely surrounded by the peritoneum have a sac; now, as they are the organs which most usually protrude, it follows that a hernial sac exists to almost every one of these tumours. The bladder and cæcum, being but incompletely environed by that membrane, are therefore the two which have no such serous envelope. This hernial sac is of great importance as it respects the reduction of herniæ of some standing, as it very readily and quickly contracts external adhesions. As, finally, a hernia which is not kept up by a truss is susceptible of increasing, after the first formation, by a new issue of viscera, at longer or shorter periods, it is easily conceivable, that a tumour of this kind may be formed of several successive herniæ, having either one sac or several, variously arranged; that it may consist of two herniæ, one with, and one without a sac, and so on. If to the above circumstances are added the alterations which result from the irritation kept up in the parts of which the protrusion consists, owing to the constriction which the ring exercises upon them, to compression or friction by suspensories, dress, &c., to the injury resulting from the weight and dragging of the tumour itself, all of which end in the formation of septa and frena between the bowels, or with the sac; the thickening, induration and morbid changes which the latter organ must undergo, and which may make of it a kind of hard shell; its adhesions with the other contained viscera, and to the circumference of the orifice, and external cellular tissue; and many other varieties too numerous to be detailed; if all these, we say, be taken into consideration, the impossibility of reducing a hernia after a certain time

will be readily understood; and it may likewise be comprehended how, when a tumour is distended by viscera which have protruded at different times, so as to constitute one general hernia by the super-addition of several successive smaller ones, it becomes impossible to reduce more than a large part of the whole mass, and the remainder continues to be perfectly irreducible.

From the preceding observations it results, that herniæ, considered in a therapeutic point of view in relation merely to their reducibility, will form naturally three classes: first, the reducible; secondly, the *irreducible;* and thirdly, a mixed class, or the *partially reducible*, which will include such cases of this kind as admit of the reduction of a part of the contents of the sac, whilst that of the other cannot be effected.

It is necessary, in order that the reduction of a hernia may be practicable, first, that no great disproportion shall exist between the bulk of the protruded intestines and the diameter of the aperture through which they had escaped; secondly, that this aperture do not exert an undue constriction upon these parts; thirdly, that there be no adhesions either outside of, or within the sacs; fourthly, that the hernial sac itself be unaltered, which by an increase of its thickness and consistence, might have so much the more lessened its mobility.

Irreducible herniæ are all such as are found to be placed under opposite circumstances to those which have just been enumerated.

It is stated, that as a general rule, the more recent a hernia is, the more easily it is reducible. This remark is true of those which have threatened for a long while previous to protrude; because the outlet tended to dilate before the long continued pressure of the viscera behind. This fact is observable in congenital herniæ. But the contrary holds good in those herniæ which, without premonition, are suddenly produced through a laceration resulting from any violent effort; these cases are often irreducible from the moment of their formation, owing to the narrowness of the passage through which they have passed. Old standing herniæ are likewise irreducible, but we are then to attribute the cause to the organized adhesions, and to the various morbid alterations to which they have given rise.

No recent hernia should be pronounced to be irreducible until after every means of reduction previously mentioned has been exhausted. In these cases we should not scruple to avail ourselves of the abilities of our professional brethren; for it will often happen

that one surgeon will reduce a hernia, which another had failed to accomplish. But we are not to make any violent efforts for this purpose, for fear of accidents. When none supervene, and every attempt has for several days been put unavailingly in practice, nothing remains for us but to support the tumour, and guard against a new protrusion of parts, by the use of the suspensory apparatus.

This comparatively happy state of things, however, will not always exist; and on the contrary, it very frequently happens that the irreducibility of the rupture is followed by an assemblage of symptoms to which the term *strangulation* has been applied.

The production of this occurrence is effected in several ways. In the first, the viscera, of whatever size they may be, are at once strongly constricted by the outlet, so that circulation is impeded in the vessels of the protruded part, and as it regards the intestines particularly, all continuity of canal is forthwith suspended. The second variety is that, in which the stricturing of the intestines was not at first very great, but by remaining out for a little while, they cannot be made to return, owing to the increase of their size by an accumulation within of fœcal, alimentary, mucous, or gaseous matters; a condition of things called *engouement*, or *puffiness*. Puffiness presupposes the presence of intestine in the hernial tumour. It is most common in old herniæ; but is not unfrequently productive of strangulation in those which are recent. A third kind of strangulation, again, is that created by an inflammation induced in the tumour, by early violent and ill-directed efforts to return it, and the administration of irritating medicines, even though by more judicious treatment, the reduction could perhaps have been effected with sufficient ease. The tumefaction thus brought on is not long in causing the irreducibility of the hernia. And lastly, this truly alarming occurrence may happen at a shorter or more distant date, and result from strictures which bear upon different points, and from various causes, into an account of which it is impossible for us to enter. Whatever the cause may be whence the strangulation has proceeded, it is said to be present, when, the tumour being irreducible, the contents of it inflame. If one of these be a portion of the alvine canal, we find superadded to the local symptoms about the swelling itself, viz. tension, pain, resistance, doughiness and tumefaction, others, which are indicative of an interruption of the continuity of the intestinal canal, among which constipation and hiccup are the chief; next vomiting at first natural, then bilious, and lastly, stercoraceous,

together with all the coincidences of an intense peritoneal inflammation. The latter affection, indeed, be the viscera contained in the hernial tumour what they may, is almost always an adjunct to strangulation. Strangulation is a serious event, which imperiously demands the performance of the operation. It is almost invariably fatal when left to itself; and the happiest spontaneous termination which we can expect, is that of gangrene of the parts situated outwardly, and consequently, when intestine constitutes a portion, the establishment of an artificial anus.*

Since then, a hernia is a malady which is followed by occurrences so disastrous, the necessity is apparent for using the utmost care and diligence in effecting its reduction as soon as possible after it has appeared.

Let us now suppose a surgeon to be sent for to a patient whom it has just attacked; the course which he is to pursue will depend upon there existing, or not existing, symptoms of inflammation and of strangulation.†

If there is nothing to denote an inflammation of the parts which are contained in the tumour, neither pain, tumidity, nor any other symptom about the lower part of the abdomen, we may begin at once to attempt its reduction, upon the principles hereafter to be laid down upon the subject of the taxis. If our trials, however dexterously made, are fruitless, we are to place our patient in a bath; and after a lapse of a quarter of, or half an hour, attempt its

* When a hernia has from any cause taken on inflammation, and increased in bulk; or, when, owing to some strain or violence, it has descended suddenly in greater quantity, pain in the tumour and belly, constipation, a desire to vomit, and fever ensue. If these are appeased by a return of the viscera, all may do well. If the means used for this purpose are not availing, the pain and tenderness excessively augment, and all the other symptoms are aggravated. Now, the least delay is dangerous; but little time can be allowed for the attempts at reduction, and if they fail, the knife must at once be resorted to. If it is too long neglected, or employed too late, the vomiting becomes fœcal, distressing hiccup sets in, the pain, tenderness, and jactitation subside; a cold and clammy sweat breaks out upon the skin; the pulse sinks; the eyes are glazed, the cheeks pale and sunken, and the patient, perhaps amid self congratulation upon the alleviation he enjoys, and prospects of ultimate recovery, is convulsed and expires. Upon examination, peritonitis exists, with blackness and sphacelation, perhaps laceration of the strictured intestines, and adjacent viscera, and effusions into the abdomen of fœcal matter.—*Trans.*

† See Note XIII., Appendix.—*Trans.*

reduction for the second time. In this we are often successful, and we have then only to keep up the hernia, except that some general attention is to be paid, according to the nature of the symptoms, to the time for which the protrusion has existed, and to the irritation which the parts may have suffered by the repeated attempts at the taxis.

When, notwithstanding every means which we employ, we cannot effect the reduction, we should endeavour, as much as possible, to ascertain if the belly is free, and whether, nevertheless, the tumour, without evincing any signs of inflammation, continues to increase in bulk; if it does, we have reason to apprehend an *engouement*. In this state of things, several means are resorted to. Dashes of cold water, or applications of pounded ice have sometimes succeeded in effecting the return of an inguinal hernia, by causing externally a reduction of the hernial coverings, and internally, a contraction of the cremaster muscle. Astringent applications of tan, the pulp of gall nuts, pomegranate bark, or lotions made by steeping compresses in decoctions of any of these substances, produce, by constricting the tissues, a nearly analogous effect. The latter of these measures are without danger; but applications of ice, when too long continued, have sometimes been followed by freezing of the hernial coats, and it is moreover, to be apprehended, that they may be attended with such a reaction as might induce inflammation of the tumour. It has been advised to give opium internally to athletic patients, to lessen by the effects of the narcotism it produces, the resistance offered by the muscles to the return of the intestine. With a like intention, the introduction into the urethra of a bougie, the end of which had been spread with three or four grains of gummy opium, has of late been commended. It would appear that it acts with great promptitude when administered in this way; and, even when it does not effect the spontaneous reduction of the tumour, at least very much increases the chances of success by the taxis. But among narcotics, *tobacco* cannot be passed over in silence. It was formerly proposed by Heister and Dehaen, to inject its smoke. In England and in Germany it is very customary to administer by way of clyster, a drachm in either an infusion or a decoction. This is done with the two-fold object of inducing general relaxation, and of exciting the peristaltic action of the intestines. Either of these effects is dangerous; the last as adding to an irritation already too serious, the first as causing a

general prostration, which has in many instances produced death, when the quantity injected at a single time was two drachms, or even one only. It is the advice of Sir Astley Cooper therefore, not to make the injection with more than *half* a drachm.*

Finally, we have been recommended to exhibit gentle purgatives, in the hope that the contractions of the intestine might, by pulling upon the knuckles of bowel included in the sac, effect their re-entrance into the abdomen. Great surgeons are however of opinion, that these means can alone be proper in cases of puffiness of large old herniæ. In recent protrusions, it would be the more dangerous, as the abdomen and tumour would be the seats of acute inflammation; and even did this not exist, it might be the cause of its development.

A great many authors recommend the employment of the articles now enumerated, when a hernia is strangulated, and we are desirous if possible to avoid the operation. It has to us appeared better to describe them as more called for in cases of recent herniæ, which though irreducible, as yet offer no symptoms of strangulation. When a hernia is positively in a state of strangulation, the efforts of the surgeon must be directed to lessening the inflammation; by this means alone can we reasonably hope to reduce it, and any and every other measure, the effect of which could be to increase irritation, should upon that account alone be proscribed.†

When, therefore, the surgeon, called to a patient, has detected *the existence of a strangulated hernia*, he must first perform a copious venæsection, even to syncope, and place his patient in a warm bath; after these preliminaries the reduction is rendered more easy. If he cannot reduce the hernia whilst the patient is in the bath, and

* R. Tabaci fol. pulv. 3j. Aq. Bullient. ℔j. Let it infuse for a quarter of an hour, then strain it, then inject *half* the quantity. *Sir. A. Cooper's Lectures.—Trans.*

† The practice of Sir A. Cooper and others, by no means restricts the employment of ice, tobacco enemata, &c., to the state of *engouement*, but sanctions their use when severe symptoms of strangulation exist. These, with the bleeding ad deliquium, the bath and the taxis, intermediately and occasionally, constitute all that can be done. If such excessive tenderness exists as to render the taxis unbearable, ice should be for some time laid over the tumour, which often allays it, and has been alone successful in returning the intestine.—*Trans.*

there are marks of high inflammation about the tumour, he should cover it with leeches. When they have fallen off, the bleeding from the bites should be promoted by emollient applications, and enemata of a like character should be administered to the patient. If in spite of this antiphlogistic treatment, new attempts at reduction made with skill are ineffectual, it is useless to make trial of any other means; it would at once be losing precious time and greatly adding to the risk of the symptoms. The operation, in such a case, is our anchor of safety, and if the surgeon himself is not sufficiently familiar with the capital operations to perform it, let him directly send for some professional friend in whose surgical abilities he has sufficient confidence.

We are not, in giving our advice to hasten to the performance of the operation in strangulated hernia, ignorant of the fact, that some surgeons, by temporizing, have obtained the reduction of cases, wherein no such result could have been calculated on with probability. We were, ourselves, witness to the spontaneous recovery of a person who refused to undergo the operation, which some very eminent surgeons had pronounced to be necessary. These cases however, are exceptions to the general rule; and it would be a want of prudence to wait in expectation of such a termination. Let not the great proportion of patients who perish after the operation for straugulated hernia be cited as an objection to its performance; but rather let us say, with Mr. Pott, Mr. Hey, and the greater number of our own eminent surgeons, that if this operation appears so frequently fatal, it is because the resolution to perform it is taken only when it is too late, and when the most formidable symptoms, gangrene of the protruded parts, peritonitis, &c. have set in, and sometimes, rupture with effusion has already taken place. It indeed very frequently happens that time is not allowed us for delay. In proof of this we may mention two cases seen by M. Larrey, in which death occurred in two hours; and we ourselves witnessed the fate of a young man, who, in the enjoyment of perfect health at eight o'clock in the morning, was attacked with hernia which directly became strangulated, and who died in seventeen hours afterwards, at one o'clock on the morning of the following day. Upon the autopsic examination, there existed, even in this short time, beside mortification of the intestine, and laceration towards the neck of the sac, acute peritonitis, with the production of false fibrinous mem-

branes. From this we may learn how dangerous it is to temporize in diseases, the progress of which is sometimes so rapid.*

In an old and bulky hernia no other means are left us by which to diminish its size, than to promote the emaciation of the patient, and to confine him to an horizontal supine position for a considerable length of time. But, as by this means, we could scarcely effect a reduction, and still less a radical cure by obliteration of the hernial aperture, all that is generally done is to support the tumour with a suspensory bandage, suitably lined with soft substances to protect the surface and gently to compress it without injury. If, however, we were to be consulted by a patient thus circumstanced, in whom a fresh protrusion of viscera had just occurred, we might attempt the reduction of the recently displaced parts, and ultimately pursue the course now above described.

THE TAXIS.†

By the word *taxis*, a derivation from the Greek verb τασσω (I arrange), we mean the assemblage of motions employed in the attempt to reduce a hernia with the assistance of the hand. We shall describe the operation separately for each of the three principal kinds of herniæ of the abdomen.‡

The General Rules of the Taxis.—First, before commencing the reduction, all the parts must be placed in the most complete state of relaxation possible. For herniæ of the abdomen particularly, the patient is to lie upon his back, his chest bent forward upon the belly, his thighs flexed on the pelvis, but not separated. In such a situation as this, owing to the approximation of the insertions and origins of the muscles, the motions of the patient can be but incon-

* "If possible," says Sir A. Cooper, "all attempts at the reduction of the hernia should be made before extreme *pain and tenderness of the belly* come on." The disease is rapid and insidious. The operation, when well performed, is comparatively a safe one; and delay, and not it, is the cause of the danger. How distressing is it, after having wasted irretrievable time in fruitless efforts, to execute a painful operation, and to liberate a black and fetid intestine, beyond the possibility of restoration.—*Trans.*

† See Note XIV., in Appendix.—*Trans.*

‡ The efforts at the taxis should not be very often made, for fear of lacerating the intestines; and should not be continued longer than from ten to thirty minutes at a time.—*Trans.*

siderable; nevertheless, it should be enjoined upon him to keep as still as possible.

Secondly, we are to place the abdominal cavity in a sloping position as it regards the hernia. Without carrying this precept to excess, as did Fabricius ab Aqua-pendente, when he hung up his patients by the heels, it is certain, at least, that the position of the visceral cavity and hernial ring makes the re-entrance of the bowels by their own weight more easy, and particularly also by that of those within, by the traction which the stomach makes upon the omentum, and that of the mass of the bowels upon a loop of intestine.

Thirdly, we are always to direct our efforts at reduction in the direction of the canals through which the herniæ pass; that is to say, in a direction inverse to that followed by the bowels in their descent.

Fourthly, it is not proper to compress a hernial tumour straight in the direction of its axis, which procedure does nothing but crowd the viscera flatwise against their outlet. On the contrary, we are to begin by lengthening the mass of the hernia, to lessen the bulk of parts in contact with the ring.

Fifthly, we are to enter upon our attempts at reduction with the utmost patience; to proceed leisurely by a series of slow and very gentle motions; this being the only way by which we can persevere in our trials for any length of time with impunity, or by which we shall be enabled to resume them, after a time, with a prospect of success. Little reflection is needed to convince us that violent and hasty manœuvres, very far from expediting the reduction of the hernia, must add to its continuance, or frustrate the taxis entirely by the swelling which must supervene upon the contusion, or at least the friction of parts previously highly irritated; and that moreover, owing to such ill-judged manipulations, the process of the taxis might have the most calamitous results, even though we should succeed with it in reducing the intestine.

*The Reduction of an Inguinal Hernia.**—It will be recollected that such is the track of the inguinal canal, that on leaving its outer orifice, it passes from below upwards, from before backwards and from within outwards. This direction is sufficiently well expressed by the common saying, of a line drawn from the crista

* See Note XV. in Append.—*Trans.*

of the pubis, to a spot an inch and a half within the anterior superior spinous process of the ilium of the same side with this slight exception, that in this statement, no notice is taken of the inclination according to the antero-posterior diameter.

The older the hernia is, the more the axis of the inguinal canal, owing to the enlargement of its inner orifice, and the pressure of the intestines, tends to lose its oblique direction and to assume an antero-posterior one. This circumstance is of very great service in the reduction of hernia.

The patient is to lie upon the edge of his bed, in the position described in the first general rule; the thigh of the affected side being slightly *adducted*, or *rotated inwardly as well as flexed*, so as to effect more relaxation of the fasciæ; the surgeon, standing near the bed, first takes hold of the base of the tumour; if it is large enough, he does so with both his hands, and draws it forth, or elongates it in the direction of its own axis and of the inguinal canal; then he moves the mass about, with a view to mingle and distribute uniformly within it, the mucous, alimentary, stercoraceous or gaseous matters, which the gut contains. He next essays, by evacuating these materials, to lessen the bulk of the tumour; and this is done by pressing it laterally between the palms of both hands extended, whilst he encircles its neck with the tips of his fingers, to prevent the bowels from being crowded back from the hernial sac towards the opening of the ring. If the hernia be a very large one, the surgeon should only encircle the peduncle of the tumour, and assign to an assistant the duties of elongation and compression, who would use both his hands. Things having reached this point, the surgeon endeavours with the fore-finger of one hand to make the parts return which are nearest the ring, choosing such in preference as appear the loosest. As soon as a portion of them has receded, he prevents it from redescending by pressing below it with the thumb and middle finger of the other hand, and then endeavours to reduce another quantity with his fore-finger again. As the hernial sac empties, the fingers of the hand placed under the tumour, begin in like manner to co-operate in the movements of reduction; that is to say, the fore-finger gradually assists in putting up the viscera, whilst the thumb and middle fingers prevent their re-descent. At this period of the operation, the hands afford each other mutual assistance by a judicious

employment of alternate movements, the one keeping up the viscera, whilst the other is engaged in effecting a fresh reduction.

When the viscera have passed the external abdominal ring, we ought to satisfy ourselves that they are not accumulated and compressed in the inguinal canal, which would be merely to remove the seat of the stricture; although this, in large herniæ is an uncommon accident, from the funnel shape of the internal orifice of the canal in this disease. If, by feeling outside in the track of the original canal, we detect a bulk and tension such as to lead us to suspect the occurrence which we have mentioned, we shall probably put an end to its continuance by increasing the slope of the abdomen, and by crowding back the viscera by pressing our fore-finger, covered with the integuments, into the external abdominal ring; whilst we assist the action of the finger by slow pressure with the other hand upon the course of the inguinal canal, proceeding from below upwards, and from within outwards, from the external orifice.*

Practice and experience alone can direct us in the selection of such manipulations as best become the particular species of viscus which is out of place. Loops of intestine are generally more difficult of reduction than omentum. This is owing to their extreme mobility, the ease with which they escape from pressure, and the rapid changes in their volume in different parts, particularly when they contain gas. Their reduction is suddenly effected, and with a peculiar and very characteristic *gurgling* noise. When at length this is obtained, we must *directly press upon the abdominal ring*, but for which precaution, if the orifice were of any size, they would instantly issue again. In an *epiplocele*, on the contrary, the reduction is slowly and gradually effected. The sensation imparted by the touch, instead of the resistance proper to an enterocele, is that of a soft body, always of the same size, and not easy to displace. This species of hernia is not equally liable to reappear after it has been reduced. It may readily be conceived that when both intestine

* "Take care," says Mr. Colles, in speaking of the reduction of Indirect Inguinal Hernia, "that you be not deceived by the contents of the hernia passing backwards into the upper portion of the scrotum, instead of ascending into the abdomen. Such a mistake will frustrate your object, by pressing the intestine against the pubis, and subject it to dangerous and unnecessary violence." *Colles Surg. Anat.*, *p.* 46.—*Trans.*

and omentum are together in the sac, constituting what is called an *entero-epiplocele*, the characteristics offered are more or less a combination of those which individually belong to either species of which it is composed.

When the hernia is reduced, we should at once proceed to keep it so by the application of an inguinal truss (p. 118). But if the protruded parts should have suffered so much as to lead us to fear that they will inflame, it would be better, instead of a truss, the contact of which at first might be too hard, to apply the bandage heretofore described under the name of *spica* of the groin (p. 106), and to subject the patient to an antiphlogistic treatment corresponding in activity to the severity of the symptoms which we have reason to dread.

*Of the Reduction of a Crural or Femoral Hernia.**—To perform this operation, it is absolutely necessary to be thoroughly well acquainted not only with the common track of the crural canal, but also with the changes produced in it, first, by the fact itself of the protrusion of a hernia; secondly, according to the direction assumed by the bowels at their exit from it; and thirdly, according to the length of time that the hernia has been standing.

The crural canal, in a natural state, is contained between the deep seated and superficial layers of the aponeurosis called the fascia lata; and offers three very distinct axes, the successive series of which resemble the letter Z. The *upper axis* is that of the crural ring or aponeurotic orifice, through which the vessels pass out from the pelvis to get to the thigh; its direction is oblique from behind forwards, from above downwards, and slightly from within outwards. The *median axis* is that of the crural canal itself; its principal direction is from above downwards. The *lower axis* is that of the aponeurotic orifice, through which the vena saphena passes to empty into the femoral vein; its direction is from behind forward, and from without rather inwardly.

If a crural hernia does no more than follow the crural canal, and appear at the outer and lower orifice, it will only be necessary, in effecting its reduction, to follow the direction of the three axes, proceeding inversely from the lower towards the upper. This state of things may be met with in herniæ that are very small and quite recent, but it is not generally the case. The crural canal and its

* See Note XVI. in Append.—*Trans.*

lower orifice being dilated by the presence of the viscera, their axes become blended into one, which itself ascends in such a way as to form, with that of the crural ring, only a very obtuse angle whose summit looks backward. Moreover, the viscera which have passed the lower orifice of the canal afterwards ascend, parallel to the fold of the groin, under the integuments, taking a direction from within outwards and from below upwards. If we have succeeded in making ourselves understood, it may now be easily conceived that, in a large majority of cases, crural hernia must form a tumour which is either globular or elongated from *within outwards, and from below upwards*, situated a *little below the fold of the groin*, having its *inner edge within* the femoral vessels, then lying over them, and passing beyond them with its outer end, more or less according to the size to which the protrusion has attained.

It is equally clear that to obtain the reduction of this tumour, we must first bring the viscera from without inwardly, and from above downwards, to the lower orifice of the crural canal; then from before backwards, across this canal itself, the axis being somewhat elevated; and lastly from before backwards and from below upwards, so as to clear the crural ring itself, and effect the return of the bowels into the abdomen.

The precautions to be taken and the manipulations to be made in this reduction, are the same as those which we have described for inguinal hernia. The flexed position of the patient is here not less necessary than in the preceding case, besides which, it is yet more necessary to obtain relaxation of the aponeuroses by *rotation of the thigh inwards*, in its previously flexed position. Having succeeded in putting up the hernia, we are to keep it there by a crural rupture truss, unless, for the reasons above specified, a bandage be at first thought to be preferable.*

Of the Reduction of Ventral and Umbilical Herniæ.—True umbilical hernia, or exomphalos, is for the most part a congenital

* In a femoral hernia, ice and tobacco are much less useful than in any other species, owing to the strong fascia in front, and to the bone behind. The progress of symptoms is more rapid towards a fatal termination, and less time is afforded for the taxis or other treatment, nor is the former as generally successful. The hernia, being usually small, is more liable therefore to be mistaken for other affections. In it, Sir A. Cooper advises that not more than twelve hours should be allowed to elapse between the trial of reduction and the operation.—*Trans.*

affection; or if it be not, it is not generally produced after birth, except in very young persons from two to four months old. It does not belong to our subject to speak of the treatment of this disease, reduction not being in this, as in inguinal and femoral or crural hernia, a means of cure.

Under the name of umbilical hernia in the adult, there have been long described diseases in which the bowels do not protrude at the umbilicus itself, but around it, and by crevices or fissures in the linea alba. Tumours of this kind necessarily belong to ventral herniæ. They are to be distinguished from the exomphalos by the irregularity of their form, which is often elongated; by the slenderness of their peduncle, and by the presence of the uninjured umbilical cicatrix in some part of their volume, nearer or further off.

Recent ventral herniæ should be reduced like those of any other kind; but to do this is often very difficult, owing to the feeble resistance offered by the parietes of the abdomen, which yield before the efforts at reduction; to the large quantity of adipose tissue, which, in corpulent patients, prevents us from accurately encircling the tumour; and lastly, to the tension of the edges of the aponeurotic fissure, which press upon the peduncle of the hernia, and are covered by the protruded parts. The steps to be pursued in the reduction are not, as it regards the action to be employed with the fingers, in any way different from those concerning which rules have already been laid down.* If we are successful in reducing them, we have only then to apply a belt with a convex pad (p. 121), and treat the patient as his condition may require. In case we are unable to replace the bowels, the patient is to be subjected to antiphlogistic treatment, and we are not to undertake the operation, until symptoms of strangulation begin to appear. Generally speaking, this unfortunate necessity will not occur, the aponeurotic laceration losing a little of its constriction, and the hernia, moreover, usually consisting of omentum. In persons who are very anxious to be rid of this incumbrance, long continued supination, and a rigorously low diet for a long while pursued, seem in these cases to offer some prospects of success. The retraction of the bowels, and of the epiploon more particularly, and the laxness of the wall of the abdomen from the emaciation alone, have often been successful in effecting spontaneous reduction of ventral hernia, in cases in which the surgeon's art had been exercised in vain.

* The pressure here is to be made directly backwards.—*Trans.*

In addition to this, when a ventral hernia is not followed by alarming symptoms at once, none need be feared for the future, unless a new issue of viscera should occur; it speedily contracts adhesions to the neighbouring cellular tissue, and needs only the belt or pad to limit its increase. The like may be said of herniæ of the same kind which are of more or less standing, and have long been irreducible. When speaking of trusses, we stated the necessity of concave pads in these cases, to contain and to protect the tumour.*

* After the reduction of a hernia, peritoneal inflammation is by every means to be guarded against, and the sooner healthy motions are procured from the bowels, the better. The recumbent posture is, for some time, to be observed, nor must the patient be permitted, on any pretence, to change it for an erect one, until a suitable truss has been accurately fitted.—*Trans.*

OF WOUNDS.

Wounds are solutions of continuity, generally the result of an external cause.

Wounds differ among themselves greatly, by reason of their seats, their directions, their extents, their shapes, the nature of the causes which produced them, the kind and number of parts involved, their simpleness or complication. Every one of the circumstances now enumerated is of vast importance in the establishment of the diagnosis of wounds; and it is from a consideration of them, taken in the aggregate, that the surgeon deduces his method of cure.

As it regards the seat of wounds, they may be met with in any part of the body; on the head and face, in the neck, chest, belly, or upon the limbs. They are dangerous according to the part which they are in; and moreover, in each particular region, according to their involving important organs, large blood vessels, or nerves, or as they are at a greater or less distance from them.*

The course of a wound in the direction of its depth, will enable any one to decide by his anatomical knowledge, what are the parts which may have suffered lesion. The direction of the wound with respect to the median plane of the body, or to the axis of a limb, according as it is oblique, transverse, or longitudinal, furnishes us with therapeutic indications as to the position to be given to the parts and the kind of bandage which will be needed for the re-approximation. A third point of view, finally, in which the direction of a solution of continuity should be considered, is the way in which the tissues involved have been divided. In parts which consist of fibrous textures, such as fasciæ, tendons, muscles, &c., this is a matter of very great importance.

Wounds are to be understood as *extending* in three directions;

* See Note on Particular Wounds, No. XVII. in Append.—*Trans.*

in length, in width, and in depth. Wounds which are very extensive in length only, so as to involve merely the integuments and cellular tissue, heal quickly and without unfavourable symptoms, as is the case with a scarification. An extent which both in length and width, but not in depth, is considerable, may be severe enough to put the life of a patient in danger. Of this kind are wounds with loss of substance, burns in particular, and also contusions. Again, wounds of great extent in all three directions, length, width, and depth, are always very dangerous occurrences; of this kind are large contused wounds inflicted by the fall of some very weighty body upon the part, such as a stone, a beam, or a projectile of any size propelled by gunpowder. Lastly, depth alone is of itself, sometimes, a disorder imminently dangerous. Of this, punctured wounds are instances. The prognosis in this case will depend upon whether the wound involves, or not, important organs, large vessels, or nerves of considerable size. The very important division which is made of wounds of the walls of splanchnic cavities, into *penetrating* and *not penetrating*, depends upon the presence or absence of this circumstance. Owing to the serious distance to which it may have extended, the depth of a wound is one of the elements of the diagnosis connected with that injury, which we ought to ascertain with the utmost accuracy.

The cause of the lesion generally decides the shape of the wound. Thus, those created by incision are elongated. Wounds from punctures, or a musket ball, are circular. Wide, contused wounds are usually irregular, and lacerated ones lie oftenest in flaps. The mode of action of the cause, the difference between the involved tissues and the unequal resistances which they offer, all give rise to the utmost variety in the shapes of wounds.

Wounds, according to the nature of the inflicting agent, are divided into those which are caused by *puncture*, *incision*, *contusion*, *laceration*, *rupture*, *bites of poisonous or rabid animals*, or by *burns*. The first three, being the more common kinds, have served as the basis of a classification very much used among writers, under the denomination of wounds by cutting, puncturing, and contusing instruments. The nature of the wounding instrument exerts a great influence upon the severity of wounds. Generally speaking, the wound heals more quickly, when a very neat, or, as we say, *clean* division has been made, and not any bruising or laceration of the tissues. From this it follows, that wounds from cutting instruments are the least dan-

gerous of all; the healing of other wounds, on the contrary, is usually retarded by the supervention of symptoms which their severity has engendered, and to which their intensity is proportionate; as well as to the number and sensibilities of the tissues implicated in the lesion. As it regards the wounded parts themselves we say that wounds are slight, when they merely affect the skin and cellular tissue; their severity increases with their depth, because by that more tissues are involved. Muscles, when wounded, contract their fibres, and hence we have a separation of the lips of the wound. Particular apparatuses are, in this way, rendered necessary to effect and keep up the re-approximation of the divided ends. A wound of an artery or deep vein is followed by an hæmorrhage, the more formidable, the deeper the vessel lies. In visceral cavities, these hæmorrhages are almost always fatal. Injuries of nerves are attended with paralysis, if their section has been clean and entire; but should they have been only in part divided, or torn in the section, excruciating pain, convulsion, and lock-jaw itself may follow the injury. Lastly, the viscera are sometimes injured by wounds inflicted upon the sides of the cavities in which they are contained; the danger which follows such lesions, though always great, is however of different degrees, according to the importance of the organ in the economy, to its functions, and to the ease or difficulty which will be experienced in confining it to a state of repose. Thus, the heart, owing to its importance, to the overwhelming flow of blood which follows a wound in it, and to the impossibility of arresting its movements, is of all viscera, that whose lesions are most certainly fatal. Not so are injuries of the membranous viscera, the stomach, the intestines and the bladder. The ease with which their functions can be interrupted, their motions controlled by dieting, anti-phlogistic measures and gentle pressure, joined to the quickness with which they contract adhesions by their peritoneal coat, renders a recovery from a wound of one of these organs, of no infrequent occurrence.

By way of concluding all that relates to the differences which exist between wounds, considered in a general manner, it yet remains for us to allude to the distinction that there is between their states of simpleness and of complication. Simple wounds are those, which although they involve one or several tissues, excite no apprehension of accident, and demand merely to be permitted to reunite. Complicated wounds are such as are either attended with, or may be followed by, some unfavourable symptom or other, such as to

demand some particular method of treatment. Simple wounds are those which are here chiefly to engage our attention.

OF SIMPLE WOUNDS.

Under this denomination are placed wounds which are inflicted with a cutting instrument, the neatness of the section produced in these cases making them much easier of cure.

It was before said that simple wounds demanded no other treatment than attention to reunite them. This may be effected either at once, or after a longer or shorter time. These two varieties have received the appellations of *first and second intention;* and they establish the distinction between wounds which suppurate, and those which do not.

Three phenomena attend the infliction of wounds; viz., pain, effusion of blood, and divergence of the lips of the solution of parts.

The pain results from the section of nervous filaments. The intensity in which it is present differs with the degree of sharpness of the instrument, with the sensibility of the injured part, or of the patient himself, and chiefly, with the moral condition of the individual at the moment of the reception of the wound. Thus it is that long anticipated pain is felt with acuteness, although that which is unexpected, or results from an injury received whilst the mind is intently engaged, is scarcely perceived to have been inflicted.

The effusion of blood is supplied by the venous and arterial trunks which have been divided. During the first few moments, the moderate discharge from the capillaries does good; it lessens the risk of consecutive inflammation; after a quarter of an hour at the furthest, it ceases spontaneously, demands no special attention, and, notwithstanding the opinions entertained among the older surgeons, certainly facilitates immediate adhesion. Reunion is not even contra-indicated by a more ample flow from the arterial twigs. A mere apposition of the lips of the wound, as is seen in hare-lip, is sufficient to suspend it. But when blood flies with force from the open end of a divided vessel of certain size, this is *hæmorrhage* properly so called, which demands prompt succour of an appropriate kind. Of this affection we shall hereafter speak.

Divergence of the lips of the wound is of two sorts; primitive

and secondary. The first is attributable to several causes. First, the thickness of the wounding instrument, as it passes through the parts; but this cause is much increased by the great retraction which results from the elasticity or contractility of the divided parts, and therefore deceptive. All the tissues possess elasticity, but in particular the skin; to this property we are to attribute the sudden separation of the lips of an incision which only goes through the thickness of that part. Separation is greater in this case, moreover, when the skin is connected to the subjacent parts by a very lax cellular tissue, and the reverse. In the fore part of the neck, and at the fold of the joints, it will therefore be very considerable; less so upon the integuments of the skull. Retraction from elasticity is no less evident in the arteries. It is owing to this, that the vessels retreat amid the muscles, and it is sometimes a very difficult thing to tie an artery which has been cut across. Contractility is energetic in muscular fibres. It is this which causes the sudden separation of the two ends of a muscle that is transversely divided, and which separation is so much the greater as the length of the fibres is great also. Retraction, lastly, be it from one or the other cause, is the more marked, the greater the tension of the wounded part was at the moment of the occurrence of the accident.

Secondary divergence is the result of some accidental irritation, to which the tissues, at any subsequent period, are subjected. The more common causes of it are, an unfortunate situation of the wound, injudicious treatment, the untimely applications of ointments and pomatums, and the improper exercise of pressure upon the wound. The degree of separation produced by these different circumstances will vary, according as they have been productive of simple irritation or of inflammation. The inflammation which takes place in the lips of a wound which was originally united by first intention, first causes the destruction of that union, and then separation; from the two-fold fact of the irritation in the tissues, and the detachment of their adhesions, either to the adjacent parts, or to one another.

The signs by which we establish the prognosis of wounds, are of two sorts, the commemorative and the diagnostic. *Commemorative* signs are derived from the circumstances attending the wound, such as the position of the patient at the moment it was received, the wounding instrument, the manner in which it acted,

n d the like. *Diagnostic* signs are either the sensible or the rational. The sensible signs are those by which, from observation, we ascertain the condition of the injury and its size and direction, &c.; the rational signs indicate the degree of danger which may attach to it. Thus an hæmorrhage bespeaks the lesion of an artery, and paralysis is indicative of that of a nerve. Again, the prognosis varies not only according to the circumstances connected with the wound itself, but to a host of others, some of which concern the individual himself, such as his age, habits, state of health, and moral condition. Others have no reference to him personally: such are the influences exercised by the seasons, state of the weather, prevailing epidemics, &c.

*Of Union of the First Intention, or Primary Adhesion.**—Union by the first intention may be said to be indicated, whenever the edges of a wound bleed, and no other change has occurred in their texture, than mere division of them. Loss of substance is a contra-indication of it only when it is extensive, or when the subcutaneous cellular tissue is of too close a texture to allow the edges of the solution of continuity to be placed in apposition. On the contrary, when the integuments possess a certain degree of mobility, we are, by position, bandaging, and the use of adhesive

* Every divided body tends to adhesion; this is a natural law. Although it is evident that this process is, in very many of its effects, highly injurious to the welfare of the system, yet it is again, in others, the salvation of the patient. To it are owing recoveries from many wounds, as of the intestines for instance; to it is owing the success of many operations, and the healing of our incisions in the most favourable way. By adhesion, hæmorrhages are arrested. It is truly a work of reparation and of reproduction, of which the great agent is the cellular tissue; and it must *always* result from that *inflammation called adhesive* by Mr. Hunter. This inflammation sets in on the edges of the wound which are in contact, and if the strength of the patient is proportionate, adhesion ensues, called "union *by the first intention.*" To the limpid serosity which the cellular tissue, in a state of integrity furnishes, succeeds the *secretion* of organizable lymph, which concreting into a membrane, which is here thick and there thin, fills up the voids, smooths the surface of the wound, and admits of the adhesion of its edges. In twenty-four hours it is white and areolar; in forty-eight hours or less it is traversed by blood-vessels; in three days it is solid and vascular, and often firmly organized in six. If once broken up, it will seldom re-occur, and hence, in treating wounds, caution upon this point must be observed.—*Trans.*

strips, to stretch it to the full extent of which its elasticity will allow.

The same may be said, in wounds of some size, of the presence of a foreign body, which it has not been practicable to extract; it is useless to let a large surface go on to suppurate for the sake of extracting by it a foreign body of small size; for, either its presence in the part will not interfere with its functions, and it may envelope itself in a cyst, and continue to be inoffensive; or it may prove an ever acting source of irritation, and in that case will inevitably give rise to an abscess, and will be expelled outwardly, according to the physiological axiom of the great John Hunter, that "deep seated inflammations always tend to reach the surface, and eject the cause by which their existence was maintained."

In wounds in which flaps have been made, no matter how large they may be as compared with the narrowness and feeble vascularity of the peduncle by which they still adhere to surrounding parts, we must put them back *in situ*, and keep them there; for facts have now fully demonstrated the possibility of their being saved, even when such a thing seemed not in the least probable. Nay, more, if we are called at the very time that a wound is received, together with a loss of substance, we are justified in picking up the fragment, cleansing it, and notwithstanding that it has been entirely separated from the body, in reapplying it to the part to which it originally belonged. Since the case reported by Garengeot, as to the authenticity of which surgeons could not agree, this advice has long been a subject of dispute; but we are now in possession of a very great number of facts of the same nature, so that no doubt any longer remains as to the possibility of recoveries of this kind.

Four means are practised for placing in apposition the edges of wounds; position, uniting bandages, sticking-plasters, and sutures. Of the advantages to be obtained from the first of these, and of the manufacture and use of adhesive strips, we have spoken so fully under the head of Surgical Dressings, as to have very little to add in this place to our previous remarks on the subject.*

Position must always be so calculated as to place the edges of

* See p. 25, and the twenty following, for the manner of applying dressings, &c.—*Trans.*

the wound in the most complete state of relaxation possible. As an illustration, in wounds of muscles in which the fibres have been transversely divided as it respects their length, the part ought to be placed in the direction which, if these muscles were to contract, they would cause it to assume; i. e., in extension if *extensor* muscles are wounded; in *flexion* if they be flexors, so as to counterbalance the action of their antagonists.

It is very evident, that should the wound occur in the muscle parallel to its fibres, the position directed must be inverse to that which has now been detailed; and again, that if the division of fibres be somewhat oblique, a position between the two is to be adopted. In spite of the great advantages which, in a very large number of cases, we derive from position, in re-approximating the edges of solutions of continuity, there are, nevertheless, certain parts of the body in which it can scarcely be said to be of any utility, as at the upper part of the head, in the nose, ears, and upon the sides of the ginglymoid joints; but here, fortunately, the effects of retraction are, on the other hand, but very little to be feared.

Uniting or *incarnating bandages* are of two kinds, according to the direction of the wound, whether longitudinal or transverse; they are, however, not indicated unless the part upon which they are applied offers a solid point of support.

The Uniting Bandage for Longitudinal Wounds.—It consists, first, of a long compress or bandage, which is a little wider than the wound is long, and of a length sufficient to go three or four times around the part; secondly, of two graduated compresses, the length and thickness of which ought to be proportionate to the length and depth of the wound. The bandage should be slit at one end, as many times as it is inches wide, so as to have a number of tails; each of which must be long enough to envelope about three-fourths of the circumference of the part for which the bandage is designed. Then measuring this circumference we mark its length upon the bandage, starting in the mensuration from the roots of the slit tails. At the place to which this length reaches, we make as many button-holes across the width of the bandage as there are tails at the end.

Having thus prepared our apparatus, we lay the diseased part in a proper position; and, if it is a limb, give it to assistants to hold. We next offer the middle of the bandage, that is to say, the space

midway between the button-holes and the roots of the slits, upon that part of the body or limb which is diametrically opposite the wound. Then we place the graduated compresses upon the edges of this solution of continuity, at a greater or less distance from them, according to the depth of the wound and the thickness of the compresses themselves; after which we bring up the ends of the bandage towards the division. The thick edge of the compresses in this situation, presents a plane the inclination of which ought to be such, that, were it to be continued, it would pass through the fundus of the wound. Things being in this condition, each strip is passed into the button-hole to which it corresponds; we satisfy ourselves that our graduated compresses have not been disturbed; then, pulling in a contrary direction upon the *centre* of the bandage with one hand, and upon the strips or tails with the other, we approximate the edges of the wound from the fundus towards its surface, by the pressure exercised upon the graduated compresses, and which causes them mutually to approach. During this manœuvre, we are careful not to make too thick folds with the ends of the bandage, and that the line of intersection exactly corresponds to the length of the wound. To conclude the application, we lay the ends upon the part, and keep them there by circular turns of the bandage, which overlap them. When its length is exhausted, we fasten its loose end by pins.

The uniting bandage for *transverse* wounds is a very solid one, and answers very well the purpose for which it is intended; but, as it makes circular compression with considerable force, it is proper, when it is used upon a limb, first to apply the spiral bandage over the whole of the limb below where it is to come, to guard against the unpleasant effects which result from venous or lymphatic accumulation.

The *Uniting Bandage for Cross Wounds.* It consists of two long compresses or bandages, which are rather wider than the wound is long, and which must be as long as the whole limb itself. One of the two bandages is slit up for one half its whole extent into strips of an inch wide. The other has in its centre as many longitudinal button-holes. Besides these we require to have two single-headed roller bandages, three fingers wide, and long enough to encircle the limb in a succession of turns.

We shall here take occasion to repeat the advice given just now by itself, of surrounding, before we apply the bandage, the end of the

limb below it with a separate small bandage, whether from the hand to the wrist, or the foot to the ankles, according as we are operating upon an upper or lower extremity. The latter of these we shall select as an example of the method of procedure.

The limb being placed and kept in a proper position, we first apply the lower compress upon the leg, in such a way as that the button-holes, which there are in the middle, shall correspond with the wound; we fasten it below with a few circular casts of the roller, reverse the end, and fasten that by other circular casts also. Then describing a series of ascending turns we successively cover this strip, from below upwards, until we come to the vicinity of the wound, when we give the roller to be held by an assistant. We then proceed to apply the upper compress; extend it on the thigh, fasten it in the same way, descend by new casts to near the wound, and give this roller also to the same assistant. Next the surgeon passes the strips of the upper compress into the button-holes of the lower one; pulls them strongly in opposite directions to bring the edges of the wound together; then lays the tail of the upper one upon the leg, and that of the lower one upon the thigh, where they are steadily held by a second assistant.

The surgeon, then taking the head of the upper roller, comes, by a succession of turns from above downwards, to the lower part of the limb, at which he fastens the terminal end; afterwards, with the lower roller, ascends by like turns to the upper part of the thigh, where the bandage ends.

This apparatus is extremely complicated, tedious and difficult to apply, and but imperfectly answers its purpose. It only accurately approximates the skin, which, by adhesive strips and proper position, would be just as easy. As to the muscles, although the direction of the two series of turns of the bandage, by crowding them from opposite ways towards the wound, tends to bring their ends into contact, this effect is nevertheless much interfered with by their contraction. Cicatrization in this case takes place by a kind of fibro-cellular intersection. This is always observed in cross wounds of the thigh which have involved the whole thickness of the rectus muscle; all that can be done is to obtain the narrowest intersection possible, to prevent such an elongation of muscle as might interfere with its contracting. We are acquainted with a person thus situated. Owing to a transverse wound of the anterior third of the left thigh, the parts having been placed in very imperfect apposition, a very

wide and thin cicatrix formed; so that, at this spot, there is a depression of two fingers width, and about four lines deep, and the extensory motions of the limb are extremely limited.

Suture was formerly one of the most generally employed means for producing reunion; but since Pibrac and Louis have enlightened the minds of practitioners as to the innumerable inconveniences by which it is followed, and its inutility in a large majority of cases, its use has been almost wholly abandoned. The inconveniences, of which suture never can be divested, are irritation from the presence of the ligatures; stricture and laceration of parts, when, from inflammatory swelling, the knot becomes too small; and thirdly, the painful twitchings which are experienced when muscular fibres are traversed by threads; and upon these accounts, sutures have been reserved for certain particular cases in which other means are insufficient; among these we may mention, first, wounds of the lips, in which the suture called *twisted* is employed; secondly, wounds of the intestines, in which the *looped* suture, furrier's, whip, or overcast stitch, which have fallen into disuse, were once practised, besides several others, which all belong to procedures more or less complicated; thirdly, large wounds of the abdominal parietes. In the latter case, two kinds of suture are proper; the *interrupted* suture, or that by separate stitches, either with the usual ligatures, or with the tape ones used by M. Graefe of Berlin; and the *quilled suture*. Such sutures as have, when used at all, been resorted to in the more capital operations, we shall not describe. Every day, attempts are being made to restrain the frequency of their performance, and some surgeons no longer introduce them even in large abdominal wounds, and instead of them rely on position and the body bandage. Of late years, several successful Cæsarean operations have been performed, without having recourse to gastro-raphe. But, as the procedure of sewing up wounds is not yet abandoned, if any circumstances were to be met with which should render it imperative to employ it, the surgeon ought to prefer the quilled suture, as being less irritating than the interrupted. The two latter sutures we shall now summarily describe. The interrupted suture is of very general application, and each time that there is a flap in a wound sufficiently movable not to be kept adherent by ordinary means, it is put in practice. To the above, we shall also conjoin that of the twisted suture, which is indispensable in the treatment of wounds of the lips.*

* The number of sutures required for any wound will depend on the extent

The Interrupted Suture.—In performing this suture, we make use of a perfectly semicircular *needle*, commonly called the *surgeon's* needle, flattened in the direction of its curve and having both sides sharp towards the point; the other is perforated with a hole or eye to allow of the passage of a *flat ligature*, made of two or several threads of silk, waxed and laid parallel, side by side. The needle is held between the thumb, which is applied upon its concavity, and the fore and middle fingers, which environ its convexity; its point must project a few lines beyond the fleshy tips of the fingers. We may commence by puncturing the flap either from within outwards, or from without inwards. In every case, we begin by presenting the point of the needle vertically to the parts, and give the instrument a semicircular motion, of which the tangent shall be the bottom of the wound, that it may include a thickness of tissues decreasing from the outer surface towards the depth of the wound. Sutures should not be placed at closer distances to each other than one inch. When the requisite number of ligatures are introduced, an assistant approximates the parts, and the surgeon ties the knots, but is cautious to do so with only moderate tightness, for fear of their producing strangulation when the slight swelling which attends simple wounds shall have supervened.

*The Quilled Suture.**—This is but a modification of that which we have just described; except that the ligatures are all passed doubled, so as always to leave a loop at the hole where the needle enters. When they are all introduced, a piece of wood, a quill, bougie, or roll of adhesive plaster, &c., is passed through the loops on

and degree of retraction of the divided part. Generally, one to every inch will suffice, which, in the interrupted suture, allows of the adhesive straps being laid on between each stitch. The needle should be introduced at about one third to half an inch from the edge of the solution on either side, and the transfixion of *integument* is generally all that is required. Angular wounds frequently require one at each angle. In tying the knots it is usual to pass the ends of the threads twice through the same loop, to prevent their yielding, and then to make one or two knots upon the ligature, for security's sake. A suture should be carried down to some depth, or it will cut out too soon through the parts which it includes.—*Trans.*

* The quilled suture in modern practice is nearly laid aside, but by M. Velpeau, in his Operative Medicine, it is remarked, "that it is at the present day too much neglected," and that he had seen a fistula in perinæo cured by it, by M. Roux, which resisted all other means, and every other species of suture.—*Trans.*

the side from which the stitching commenced; we then pull on the ligatures, and tie them upon the other side of the wound to a similar quill, &c. It is easy to conceive, that unless a wound is straight, this suture is inapplicable; it is much less irritating than the other, for the threads can neither cut out of the skin, nor give pain by causing twitchings in the muscles during their contractions.

The Twisted Suture.—In the performance of this operation, we make use of perfectly straight needles, the points of which are lance shaped. As it is intended that they shall remain in the part, it is customary to make them of some metal which is not readily oxidizable, such as silver, gold, or platinum, prepared of suitable hardness. Still, common thick steel needles will do for the purpose. Before they are used, we should grease the points, that they may pass the more readily.* In order to reunite a wound which has passed completely through and through the loose edge of one or other of the lips, we begin by placing the sides of the solution in the most perfect co-aptation; then, holding the needle between our fore-finger and thumb, its head pressing against the nail of the middle finger, it is passed through the parts from one side to the other. The track pursued by the needle should be such as that its point, being offered almost perpendicularly to the surface of the skin, at a distance of a line and a half or two lines from one edge of the wound, shall afterwards be so inclined, and subsequently raised in an opposite direction, as to issue at an equal distance from the other edge upon the opposite side, comprising two thirds of the thickness of parts in front of it.

The first needle must always be inserted above the vermillion border of the wounded lip; if the wound does not exceed three or four lines in extent, it alone is sufficient, and is directly secured by the ligature. But if the whole width of the lip is involved in the injury, which in the operation for hare-lip it almost always is, we put in two other needles. Previously to this, however, we pass the loop of a waxed thread over the side of the needle opposite to the free edge of the lip, draw down the two ends between the needle and the lip, and placing them parallel to each other, cause them to

* The best hare-lip pins are of silver, with movable steel points, which are removed when the pin is inserted, and are not so likely to catch in the dress of the mother or nurse, by which terrible lacerations sometimes occur. The interrupted suture, in a hare-lip, answers every purpose, and avoids this risk.—*Trans.*

be gently pulled upon by an assistant to make tense the parts. Then with similar precautions, we introduce two other needles; the second in the centre of the wound, and the third at its upper angle.

This done, we pass a second waxed thread over the upper needle, draw down its ends on either side, and cross them below the same needle; ascend with the ligature to the starting point, and there cross its ends anew; then bring them down to the centre needle, crossing them like the letter X, and surround it in the same way with the figure 8 turns; next we proceed in like manner to the first needle, whence we ascend again to the centre one, then to the uppermost and so on, until the silk is exhausted, when we twist or tie the ends. The ligature which was first applied is then placed in the same way.

Whatever be the kind of suture we have used, we should attend to removing it after a lapse of three or four days, when adhesion of the edges of the wound is obtained. Were we to leave the ligatures in any longer, they would cause suppuration, by which their track would be likely to become fistulous. We detach the threads of the interrupted suture, by passing underneath the knot the points of a very sharp scissors; we cut away the knot, and draw out the ligature through one of the punctures, gently stretching the parts in a contrary direction. Those of the quilled suture are removed in the same way, after the loop and knot are cut at either end.

In taking out those which encircle the needles in the twisted suture, we first moisten them to lessen their adhesion; then unwind them in the same order in which they were placed on; and lastly, remove the needles, as, in any suture, we should do the threads. All these movements are to be performed with the utmost steadiness and gentleness, for fear of breaking up the yet slender adhesions.

When the means of re-union have been employed immediately, or in a very few hours after the receipt of the wound, adhesion is sometimes effected after some days, unless some extraneous cause, unconnected with the wound itself, retards its cicatrization. All that is known about this latter phenomenon may be shortly told. After the first sanguineous oozing ceases, a slight swelling supervenes, and a reddish serum exudes from the divided surface, whose place is ere long occupied by plastic and coagulable lymph. This lymph seems to be the rudiment of the adventitious membrane, from which,

at a later period, the cicatrix is to be produced. Slight irritation attended with tumidity, by a rosy hue upon the lips of the wound, and by a gentle pruritus complained of by the patient, are necessary concomitants upon the work of consolidation. But to be healthy, the degree of this irritation must be limited. Were it to extend to inflammation, consolidation would no more take place, than it would were the wound to remain pale and flaccid. We know not how the cicatrix is organized; but at least, it is certain, that sanguineous vessels are formed which establish the communication from one surface to the other of the division of parts. Moreover, adhesion takes place in wounds in the same individual, with greater quickness the more the part is vascular, and its sensibility acute. By a parity of reasoning, it proceeds with greater rapidity in the child, and demands more time in proportion to the age to which the patient has attained. Finally, any thing which impairs the general health of the patient, excess of any kind, the co-existence of some other disease, the supervention of some irritation ab extra, &c., &c., either impedes, or wholly suspends its formation.

It was once customary in facilitating the healing of wounds, to apply, with a profusion as hurtful as it was absurd, ointments and other substances, which were supposed to have the property of reproducing the soft tissues. At the present day these irritating applications have been entirely banished from surgery, their sole effect being but to produce inflammation. So soon as the corresponding tissues of a wound have been placed in accurate coaptation, art, which is incapable of expediting cicatrization, has but to look on and guard it against what might be noxious to its progress. Upon this principle we place the wounded part at perfect rest, and by means of our dressings preserve it from the contact of air and external agents. If the injury is of sufficient extent to give rise to the fear of high inflammatory reaction, we prevent its access by subjecting the patient to an antiphlogistic regimen in proportion to his strength, and venæsection even, if called for, should be practised. If adhesion seems to be commencing in the wound, and the irritation about it theatens its destruction, we lay over it emollient poultices, and suspend their use as soon as the irritation is allayed; lastly, were any untoward symptoms to appear, the appropriate treatment must be put in practice.

Of Secondary Adhesion;—Suppurating Wounds.—Primitive ad-

hesion cannot take place: first, when the loss of substance is so great as that the edges of the wound cannot be accurately approximated; secondly, when after adhesion had been once effected, inflammation, resulting from some internal or external cause, has produced an entire separation between the lips of the wound; thirdly, when time enough having elapsed since the receipt of the injury, the wound has dried and become inflamed by the contact of air, or the friction of irritating substances; fourthly, when the edges of the wound have been violently torn or contused, in such a way as that reunion cannot take place until the layer of tissues which clothes their surface has been separated from the adjacent living parts, and has been cast off by the eliminatory inflammation; fifthly, when some foreign body of bulk has been left behind in the part, which either could not be found, or could not be extracted; sixthly and lastly, when some disease or predisposition exists, or some complication supervenes, capable of impeding the adhesion. Under the first head we may place syphilis, scurvy, scrofula, tetter and the like. To the second, belong gangrene, hospital phagedæna, &c. We shall now proceed to trace the progress of secondary adhesion, or union by second intention, which is the *only one possible* in the cases now enumerated.

When a wound with an extensive loss of substance has been inflicted, arteries of some size are for the most part divided; the first duty of the surgeon is to include them in ligatures. Moreover, for a certain time, the blood continues to issue, through the ends of the divided vessels, from the surface of the wound. Gradually the blood coagulates at the mouths of the arteriolæ, and forms plugs which put a stop to any ulterior effusion. The pain, which in the beginning is very severe, is by degrees assuaged, and at length entirely disappears. After the first few hours the flow of blood is succeeded by a sero-sanguineous oozing, which usually lasts for about two days. At this time the wound is dry; its edges are more swelled and inflamed, and are covered by a plastic film, which in all probability is the coagulable lymph, the secretion of which is the first step in the work of primitive adhesion. Presently there exudes a serous fluid from the wound, which brings with it the adhering clots and the detritus of the inorganic film just mentioned. From the fourth to the sixth day, this serous fluid grows turbid and lactescent; and the surface of the wound becomes studded with red *granulations*, whose apices are conical. Their

texture is cellular and vascular, and they bleed readily upon the slightest irritation. These granulations so arrange themselves in contact as to form a membrane of an irregular surface. In this condition, they *secrete* a yellow, thick, unctuous and almost inodorous liquid: this is *pus*, and these are its characteristic properties.* As the secretion of this fluid goes on, the swelling of the wound goes down; its edges subside, they wrinkle and tend to approach the centre of the wound. When they have stretched to the full length allowed by their extensibility, the granulations become covered towards the circumference with a very delicate pellicle, which tends towards the centre. Other and similar formations appear, like little islands as it were, at various spots upon the surface of the wound; they form very soon mutual junctions, and unite also with that which proceeds from the circumference, and beneath the shelter of the protecting cover thus formed, the work of consolidation goes on.

For some time the cicatrix is vividly red, is yet very vascular, and of an acute sensibility. Owing to the ease with which friction inflames it, and in particular that of woollen garments, it is proper to protect it by linen cloths, and to guard it against violence of motion, and from every thing which might irritate it. In progress of time the cicatrix becomes less vascular; it assumes a paler aspect; the cellulo-fibrous tissue becomes the predominant element in it; it then grows smaller, is depressed, and strongly adheres to the subjacent tissues. The depression which it makes is much greater when its adhesions are effected with bony prominences, or when the patient grows fat after his recovery, and the neighbouring integuments rise above the scar from an accumulation of adipose tissue beneath them. The cicatrix, with time, is transformed into adventitious cutaneous tissue. It is then tolerably firm; nevertheless, not only it does not possess the physiological functions of the skin, but it is also deficient

* Granulations are accretions of animal matter, resulting from inflammation. They consist of an exudation of coagulable lymph, into which new, and perhaps the old vessels shoot. Hence their vascularity. They are convex and rough, and themselves secrete pus. They are, when healthy, small and of a deep and florid red. They rise higher than the level of the skin; but if they much exceed it, become fungous and spongy, livid, and will not cicatrize. They must then be kept down with pressure by lint, or be destroyed with caustics. Granulations are fully organized with blood-vessels, nerves and absorbents.—*Trans.*

in some of its physical properties. Accordingly, we find it to be less supple and extensible than the skin; its colour is of a duller white; its surface, smooth and shining; in large cicatrices it is streaked with ridges, or, as it were, seams, extremely resisting. Besides this, the new tissue, which is usually not very sensitive, inflames and is irritated with even greater facility than the skin itself. In the very extensive scars which result from solutions of continuity of very long duration, we sometimes find a morbid sensibility existing, which, under certain atmospheric conditions suffers an increase.*

* A cicatrix is a new, organic, and generally cellulo-fibrous production, which unites divided parts. The corresponding material in bone is called callus. A cicatrix of the skin is formed, first, by the exudation of a plastic and organizable lymph upon *the surfaces* of the fleshy granulations of suppurating wounds. Owing to the contraction of the granulations, which desiccate in order to form it, and the subsidence of the edges of the solution of continuity, cicatrices are always smaller than the injuries they repair. Their organization goes on for weeks or months; they increase in density, thickness and strength, by the successive solidification of their subjacent layers. Cicatrices contain neither hair bulbs, nor sebaceous follicles; they contain no fat, and in fatty parts are always deepest; and but few exhalent or absorbent mouths open upon their surfaces. Most scars are indelible. They differ in appearance, with the cause which gave them origin, and, to the practised eye, in spite of the lapse of years, and of organic changes, they retain their distinctive characters; the scar of a burn, of a cut, of small pox, or of scrofula, having nothing in common. In vaccinating, this fact becomes useful; the appearances of a true vaccinal cicatrix cannot be too well understood. But few nerves or vessels enter them, and hence their whiteness; but they are not insensible, and they are never affected by exanthematous eruption. *Bégin. Dict. Méd. et Chir. Pract.*

A remarkable evidence of the ease with which cicatrices are broken up, occurs in the narrative of the voyage made by Lord Anson around the world, in 1740, as related by Mr. Walter, the chaplain of the Centurion man-of-war. In detailing the ravages of the scurvy, he says, "The scars of wounds that had been for many years healed, were forced out again, by this virulent distemper. In one individual who had been wounded above fifty years before at the battle of the Boyne, the wound, which had ever since been well, broke out again, and appeared as if it never had been healed. Nay, what is still more astonishing, the callus of a broken bone which had long been formed, was dissolved, and the fracture seemed as if it had never been consolidated." We are ourselves acquainted with a medical gentleman in whom, a wound of the ankle, from a musket ball, received in the year 1803, was re-opened by spasm, in an attack of the malignant cholera during the summer of 1832.—*Trans.*

We shall not here return to the subject of the attention which the patient requires during the time that nature takes for his cure; having already done so fully, under the head of dressings, on pages 33 to 38. We shall say a few words as to the regimen which he should be directed to adopt.

Inflammation being inevitable in all wounds which must suppurate, it is the duty of the surgeon to moderate its intensity beforehand. If the wound is not extensive, a light diet and a free use of diluent drinks will suffice; but if it is large and involves highly sensitive tissues, we must, by more abstemious fare, by bleeding, and all the measures known as antiphlogistic, prevent if possible inflammation from setting in. But to watch over local phenomena alone, is not sufficient; the general condition of the patient calls quite as loudly for the surgeon's care. If the wound is of much size, the period of the inflammation is, for the most part, attended with an excitement of the general circulation known as *traumatic fever;* nor is it uncommon, in this state of irritation, which always follows serious injuries, to see inflammation established in some one of the viscera, but generally of the stomach and bowels, the pleura, or the lungs. The surgeon, or we might here say the physician, for he should be both, must not allow himself to be lulled into false security, by the tranquillity of the patient. Examples in large hospitals are but too frequent, of visceral phlegmasiæ which carry off the patient, and whose very existence was unsuspected from the want of positive symptoms. We are therefore, to direct the most anxious attention to the general condition of the patient, and should we detect evidence of internal affection, hasten at once to extinguish the smothering flame. In cases in which the traumatic fever, or symptomatic fever of irritation is slight, it may generally be removed by the abstraction of all the causes which produced it, by a low diet and diluent drinks, and by keeping up, by means of enemata, a soluble condition of the alvine canal.

When the period of inflammation has passed over, we may relax a little from the severity of the regimen we have imposed. Indeed, it becomes necessary, as the wound relieves itself by suppuration, to sustain the strength by food of a good and nutritious quality, cooked fruits, white meats, and so forth, taken in small quantities. In aged persons, and those who are very feeble, when the

process of cicatrization seems to languish, we may allow of the moderate use of wine and gentle tonics, to facilitate its progress; unless, however, some circumstance should contra-indicate their administration.

It is scarcely necessary to remark that if some precedent malady, such as syphilis, scrofula, or the scurvy, should interfere with the progress of the cicatrization, we should, at the same time that we attend to the wound individually, subject the patient to such constitutional treatment as may be called for by the particular disease which is known to co-exist.

But, independently of internal causes, a great many external ones may oppose the healing of a suppurating wound. The most common of these are the movements of the patient, frictions upon the surface of the wound, the irritation of injudicious dressings, and congestion following too tight an application of a bandage These different causes, when kept up for a certain time, may effect destruction of adhesions between the lips of the wound, or else chronic inflammation, and the production of callosity. Upon the surgeon it must depend to prevent these circumstances from occurring. If, however, he is not sent for until it is too late to do so, and the mischief were already done, he should treat the detachment by incision and pressure, by means of graduated compresses, as was stated in the article on dressings (see page 40), and if callous edges have formed, should first endeavour to remove them by means of anodyne and emollient poultices; and if this measure prove insufficient, by the combined use of pressure, cauterization with the nitrate of silver, or even excision, if there were fungous growths which impeded the healing.

When at length the cicatrix is formed, if it be a very large one, it is proper that it should be protected externally from blows and injuries which might destroy its fragile texture, until it has acquired suitable firmness. For this purpose, pieces of boiled leather are sometimes used, or merely flat compresses. It is guarded against rupture by repose and a state of relaxation.

We do not think it necessary here to speak of the numerous primitive and consecutive occurrences which attend upon wounds, as the particulars into which we should be obliged to enter would lead us much too far. Many of them, moreover, belong not so much to elementary as to advanced surgery, and are more or less

infrequent. One only, hæmorrhage, is very frequently met with, and as it is very alarming, demands the speediest relief. We shall treat of it in a separate article.

OF PUNCTURED WOUNDS.

Such is the name given to wounds produced by means of any stabbing or piercing instrument, a sword, a bayonet, a knife, a stylet, a needle, a thorn, &c. These are almost always serious injuries, for laceration and contusion of tissues result from their mode of action; whence it would appear that the degree of danger from a wound of this nature, was proportionate to the sharpness or bluntness of the inflicting instrument, and to the power with which it was impelled.

The phenomena which follow punctured wounds differ from those of wounds made by a cutting instrument. In general the bleeding is much less copious, and the pain much more acute. The reason why very little blood flows, is that the vessels are much contused and lacerated, which causes them to retract, besides which a much smaller number of them are wounded. The intensity of the pain which often follows even the slightest puncture, is explicable by the laceration of the nerves; and which may give rise to the most formidable occurrences, in very irritable persons, such as local paralysis, and particularly convulsions and tetanus. Books are replete with cases of this kind, and we were ourselves witness to a case of lock-jaw caused by the introduction of a thorn under the skin.

But, if outwardly the hæmorrhage be but a trifling affair, it is not so when large deep seated blood-vessels are wounded. Owing to the narrowness of the external orifice of the stab, to the want of parallelism between the different surfaces, to the different degrees of retraction in the tissues involved, and to the swelling of the parts which constitute the parietes of the wound, the blood, in such a case, cannot find itself a vent outwardly, but is poured into the cellular sheaths of the vessels, or the cellular tissue which surrounds them. This event has been called a *primitive false aneurism.* If it were not to be directly observed, it would give rise to sanguineous infiltration of the whole limb, and consecutively to a train of complications beneath which the powers of the patient might give way. It is to be treated by pressure or the ligature. If the pressure be injudiciously applied, or not long enough sustained, the effusion of

blood is reproduced down among the tissues, and takes the name of *consecutive false aneurism.* To each of these occurrences we shall return in speaking of hæmorrhage.

Pain from a punctured wound, when very acute, owing to the fatal consequences to which it may give rise, demands more activity of treatment than that from simple ones does. In them the nervous filaments having been divided, pain cannot be followed by serious accidents, unless the nerves have been imperfectly cut, or unless the instrument, from being blunt, has rather bruised than sawn them. In the first case, it is enough to put a stop to the pain, to complete the section; in the second event, the tearing which is produced is very analogous to that in punctured and contused wounds. When, therefore, very intense pain is endured after a wound from a stabbing instrument, which is not allayed by sedative topical applications, we are, by an incision along the track of the wound, to convert the tearing of the fibres into a clean section.* Many writers advise us to destroy the wounded nerves with caustic. We look upon this means as one less advisable than an incision, not merely because it were useless to give rise to the production of an eschar, and so to change a simple wound into one attended with loss of substance, but that to effect the cauterization, we should, in the greater number of cases, be obliged to dilate the narrow orifice of the puncture, which would be performing two operations for one. Still, disorganizing the nerves has been employed with success, and has received the sanction of weighty authority. It has been done with paste of minium (red lead, or peroxyd); a surer way would be to introduce a fragment of caustic potassa into the wound.

The inflammation which is set up in a punctured wound, results from the high irritation to which that kind of injury gives rise; and is an effect the more alarming when it occurs in tense and very unyielding tissues. Of this class are punctures in tendinous parts and among fasciæ and aponeuroses, such as the fingers, the palms of the hand, and so on. To prevent constriction, and the mortification

* In reference to this practice, it is said by Mr. S. Cooper, and as we think, very justly, that it is incorrect to suppose that a punctured wound can be converted by dilation into a simple one. The violence to the tissues has already been inflicted, and cannot be removed, or its depth lessened, by such a proceeding. Unless called for by the presence of matter, &c., it had better be dispensed with, and poultices be applied, with an antiphlogistic regimen and treatment.—*Trans.*

by which it is attended, incision should forthwith be performed. Every body, for example, is familiar with the quickness with which the exquisite pain and other concomitants of a whitlow vanish after it has been laid open.

We shall here merely mention the danger with which punctured wounds in large viscera are attended; this class of injuries is called *penetrating*, into the diagnosis and treatment of which we cannot enter. When, by the direction of the stab, and the kind of symptoms which manifest themselves, it is rendered probable that a lesion of some viscus has occurred, the most active antiphlogistic treatment is immediately to be instituted; but it is a rule, that we are never to ascertain by the probe, the depth of the injury, for unless some foreign body be within, the knowledge can serve no therapeutical purpose, whilst the contact of the instrument may have fatal consequences, by adding to the irritation and derangement of system already produced.*

Lastly, it sometimes happens, and in punctured wounds more commonly than in any other kinds, that the inflicting body remains in the tissues entirely, or only in part. This is owing either to the flexibility of the puncturing instrument, or to its brittleness; as is the case with pieces of glass, thorns, splinters, metallic points, &c. Of this event we are made aware, either by an examination of the substance, or by the passage of a probe into the opening. We then enlarge the wound and extract the foreign body with forceps. If we are not successful in doing this, its presence generally results in an abscess, the opening of which either causes its expulsion, or at least facilitates its removal.

Thus then, we see that incision is the best treatment for arresting the majority of symptoms to which punctured wounds give rise. We ought not therefore to hesitate about performing it early, when cases occur in which it appears to be called for.

OF CONTUSED WOUNDS.

By a contusion is meant the blow, bruise, or impression which the contact of a hard body makes upon our bodies, which strikes them by a certain extent of surface. Contunding substances are naturally divided into two classes, from the degrees of rapidity with which they are impelled; some, such as stones and sticks, set in

* See Note XVII. in the Appendix.—*Trans.*

motion by their own weight, or some moderate force, inflict, unless their weight is very great, but a slight contusion. Others again, urged with immense velocity, strike with amazing violence; for instance, balls discharged by gunpowder. Of that species of lesion called *gun-shot wounds*, we are not about to speak; they constitute a special branch of capital surgery, and are therefore removed from out of our hands.*

The effects of common contusing bodies vary according to the direction in which they encounter the object. If they fall perpendicularly, the parts, sustaining one another, yield to the blow and are pressed back before it, and generally, no solution of their continuity is visible from without; this effect is then called simply a *bruise* or *contusion.* When, on the contrary, the blow has struck obliquely as it regarded the body, the parts carried away by the motions of the missile are more or less torn, and a *contused wound* results. But we are not to suppose, because a bruise is unattended with a wound also, that it cannot be dangerous; on the contrary, it is still more so, if the force of impulsion be the same; for the tissues have borne the whole weight of the blow, whilst, in the contused wound, the shock did but graze them more or less. However, this distinction is but in external appearance; for in contused wounds as in contusions, the danger is always in proportion to the intensity of the contusion itself, that is to say, to the force with which the contunding body struck, the number and kind of tissues involved, and the depth to which the effects of the blow extended.

The effects of a bruise are laceration and breaking up of tissues in a degree which is in proportion to the severity of its cause. The denser the texture, and the more solid the fulcrum, the more serious will these effects always be. Soft parts, therefore, will be most violently bruised when they chance to lie thinly over a bone upon which the energy of the stroke has been expended.

Ecchymosis, caused by the rupture of small vessels, is a necessary result of every violent contusion. The quantity of fluid infiltrated is proportionate to the disorder induced, the degree of vascularity, and the abundance or laxity of the cellular tissue in the parts.

The sequelæ of contusions vary according to the tissues involved,

* See Note XVIII. in the Appendix.—*Trans.*

and the violence which the parts have sustained. From disorganization in the highest, down to disorganization in the very lowest degree, the affection may present innumerably varied shades. Inflammatory reaction follows directly upon the accident, and differs in its consequences with the nature of the part in which it is set up. The nerves indicate their disordered condition by the severest pains. All the symptoms which were mentioned as belonging to punctured wounds, are known also to follow contusions of these organs. Consecutive inflammation in a large artery after contusion, may result in its rupture, and the production of false aneurism. That of the fibrous tissues of the joints sometimes ends in their destruction, and in caries of the bones and of the articular cartilages. Lastly, the viscera within the splanchnic cavities, the brain, the heart and lungs, &c., take on acute and chronic phlogosis, as a consequence of contusions upon the cavities which contain them. The stomach and intestines, besides other viscera, also have been found ruptured after bruises, which, however, produced no solution of the continuity of the walls of the abdomen.

From this brief summary of the consequences by which contusion may be attended, we learn, that when violent, it must ever occasion an unfavourable prognosis. The treatment will be proportionate to the disorganization which has been induced. When the contusion is slight, the pain and swelling soon disappear. The ecchymosis, which was at first of a black colour, becomes of a reddish brown; it is surrounded with an extensive areola, of a yellow colour, veined with violet streaks. These different shades become gradually clearer, until they fade away, and are succeeded by the natural colour of the skin. A contusion, thus limited in degree, requires nothing beyond rest and the application of compresses steeped in resolvent solutions, such as salt and water, muriate of ammonia and vinegar, Goulard's lotion, very dilute aqua-vitæ camph. and the like.

If it has been violent, but without disorganizing the tissues, subcutaneous sanguineous effusions are apt to take place. The characteristics of this occurrence are slight swelling, without hardness, of a dark colour, which grows pale beneath the pressure of the finger. Sometimes the existence of fluctuation is very perceptible. We need not hasten to give issue to this effused blood, as experience has taught us that it is sometimes, after a long while, spontaneously absorbed. Resolvent applications and judicious pressure

will quicken this event. But if their use, after some time, should be attended with no benefit, and inflammation with the formation of abscess occur, an incision ought to be made in the depending portion of the tumour, and the effused fluids to be discharged.

When, lastly, by the fall of some very weighty body, or by a wheel of some heavily laden vehicle passing over a part, the tissues have been broken up and disorganized, and yet the skin be not divided, the dead parts must be cast off in sloughs by the eliminatory inflammation, before it is possible for recovery to ensue. These dreadful bruises are usually accompanied by comminuted fractures, are followed by the most calamitous occurrences, and often demand the performance of amputation.

From the remarks now made upon the sequelæ of contusions, it would appear that wounds of this description rarely unite by first intention.

They differ from one another in their location, extent, form and direction. Generally they present irregular flaps, more or less jagged and fringed, and from these flaps more or less ecchymosis spreads to the neighbouring parts. Usually too, the disorganization affects only the edges of the flaps, so that it forms merely a superficial eschar. Often the disorder is still less considerable, and the parts which were at first but slightly stunned, speedily display symptoms of acute inflammatory reaction. It is scarcely necessary to say, that in contused wounds, as in contusions merely, the ecchymosis results from the laceration of the smaller vessels, and is always in proportion to the violence of the stroke inflicted.

According to the severity of the lesion, will be the activity in the treatment of contused wounds. When laceration and bruising only have been sustained by the parts, we ought to attempt to unite them by first intention, as in the case of incised wounds; but being cautious at the same time, to apply the adhesive strips lightly, so as to allow the tumefaction from the subsequent inflammation to proceed. This symptom is to be lessened by emollient poultices. Commonly, the bottom of the wound, at the base of the flaps, unites quickly, whilst the upper part of the flaps, where the injury was the greatest, will always suppurate a little. In other instances of more elevated inflammatory action, the flaps, disorganized by the hurt, will not adhere, but become livid; active phlogosis sets in, and the suppuration which attends it casts off and brings away the

dead parts; after their fall, fleshy granulations are rapidly formed, and a cure is quickly effected. These cases are to be treated by emollient and resolvent lotions, fomentations and poultices. When the suppuration commences, adhesive strips may be used to approximate the edges and aid in their adhesion.

Hæmorrhage and the extraction of foreign bodies, considered as among the complications of contused wounds, present no indications which are not equally applicable to solutions of continuity of every other kind. There is but one circumstance connected with them, which more particularly claims the attention of the surgeon; we mean the frequent accumulation of pus at the base of the depending flaps. As this occurrence might be attended with serious burrowing of the matter and detachment of parts, particularly in wounds of the hairy scalp, for example, methodical pressure must be established at the base of the flaps to prevent any such stasis. Should it, however, be found already existent, it must be evacuated by an incision.

TORN OR LACERATED WOUNDS.

By this appellation are designated solutions of continuity which are effected by the laceration or tearing of some part of the body. Parts which project from other surfaces are particularly liable to this accident; such as the fingers, hands or feet, and the upper and lower limbs. The penis and testes, which are covered by the dress and protected by the thighs, are not equally exposed to this danger. Lacerated wounds are not of indiscriminate occurrence in every part of a limb; but are, on the contrary, confined almost exclusively to the joints; they are not only less thick, but they present, likewise, an interruption of continuousness, or a central cavity, the thin walls of which, though possessed of more or less elasticity, are incapable of reacting by an exercise of individual strength, as the muscles are which lie upon the central parts of a limb. However, when the laceration is the result of some prodigious expenditure of power, large muscles tear like other tissues; as is the case, for example, in a removal, by violence, of the arm from its articulation with the scapula, of which many instances are known.

A remarkable fact connected with this kind of injury, is the *want of hæmorrhage*, even when the largest arterial trunks are torn across in the laceration. With the celebrated case related by

Mr. Cheselden, of Samuel Wood, a miller, almost every one is familiar; the arm of this man, surrounded by a rope, was torn off by the wheel of a mill; equally well known are those of Messrs. Lamothe and Carmichael, of two children in whom the same effects resulted from similar causes; and lastly, that of Benomont, of a child whose leg was torn off at the knee, by the rotation of a carriage wheel. In no one of those individuals, notwithstanding the calibres of the axillary and popliteal arteries, did hæmorrhage ensue. The cause of this phenomenon lies in the retraction of the wounded artery, of which chiefly the outer tunic forms a conical and spirally twisted prolongation before the end of the vessel, and thus impedes the discharge of blood.*

In wounds of this kind, the lacerated tissues are torn into irregular strips or flaps; and generally the tendons extend much beyond the level of the muscular surface. We should smooth the face of the wound with a bistoury, or with scissors, so as to give it as even a surface as possible, but without removing too much of the soft parts, unless amputation should be required by the necessity of the case, as happened in that related by Benomont. The pain at the moment the injury is received is generally inconsiderable. When lacerated wounds are placed in such a condition as is most proper to conduce to their union, we should endeavour to effect it by the first intention, but with due precautions against secondary hæmorrhage, of which instances have occurred. It is a singular circumstance that wounds of this sort, when not complicated with violent contusion, heal with facility, without other attentions than those that are necessary to combat any inflammatory symptoms; this is proved by cases reported in the second volume of the memoirs of the Academy of Surgery, and by what I have myself observed in the case of laceration of the fingers, in a large manufactory, in which I have had occasion to treat about twenty of these accidents, but particularly in children, the nature of whose labours rendered them extremely liable to this occurrence.

POISONED WOUNDS.

These wounds being produced either by the teeth, stings, or

* M. Béclard maintains that it wholly depends upon the obstacle offered to the flow of blood by the interior inequalities of the vessel, created by the laceration of its inner coat. The fringed prolongation of the outer tunic, and the retraction of the vessel, are secondary agents only.—*Trans.*

fangs of animals, approximate more or less, in the nature of the injury, to punctured and contused wounds; but they differ materially from either, and are rendered much more serious, by the introduction and deposit in the wound of a poison or virus, which, when it is absorbed, gives rise to the most fatal symptoms and to death itself. To enumerate them in the order of their importance, beginning at the least, these injuries are, the sting of the bee, and that of the scorpion; the bite of the viper, of the serpents of Africa, and lastly, the bites of rabid animals. To these may be added, as peculiar accidents, wounds received by anatomists in dissection.*

The Sting of the Bee.—The bee, the wasp, and the hornet, are each of them provided with a tail or sting, which they insert, when irritated, under the skins of the superior animals, and of man in particular. According to M. Duméril, the sting has at its base a vesicle full of a venom, which it serves to introduce into the wound. This, the insect, after it has inflicted the sting, leaves behind it in the wound; an acute pain is directly felt, which is soon followed by local swelling, and sensible throbbing or pulsation in the part. If a nervous filament has been wounded, the pain is excruciating. Cabanis was witness to a fact of this kind. If a whole swarm has settled upon the same individual, and has stung him in a great number of places, a very violent irritative fever soon follows the pain, tumefaction and redness which affect the surface very extensively, and the symptoms may run so high as to jeopardize the life of the patient. M. Jules Cloquet saw a woman, who three months after an occurrence of this kind, had her neck and face still distended with an œdematous and florid swelling, where the stings had been received.

The first thing to be done after a person has been stung, is to extract the sting from the wound. After that, we anoint the parts with a liniment of olive oil, or bathe them with laudanum, eau de luce, or the camphorated volatile liniment. Cabanis, in the case above mentioned, used advantageously an oleaginous bath in which opium was held in solution, and then applied compresses steeped in the same liquid over the part. MM. Percy and Laurent advise the long continued use of cold applications. In cases in which inflammation and high febrile action take place, they should be

* See Note XIX. in the Appendix.—*Trans.*

treated antiphlogistically with a vigour proportionate to the intensity of the symptoms.*

The Bite of the Scorpion.—This is seldom followed in the south of France, with very formidable symptoms. Usually, pain, tension, heat, a livid hue, and sometimes, a few vesications about the wounded part, are all that appear. The treatment of this occurrence does not differ from that of the sting of the bee. In tropical regions, the bite of the scorpion is much more deadly; and there, the treatment which in France is made use of in viper bites, is resorted to.

The Bite of the Viper.—The viper is a common reptile in the centre and south of France. Its length is from twenty to twenty-four inches, and its diameter in the thickest part of the body from ten lines to an inch; its skin is covered with glittering scales; its back is of a bluish hue, deepest in the centre and softened off upon the sides; it is sprinkled over with blackish spots disposed in symmetrical order. Its lower surface is formed of a series of large scales of a purplish black colour; also lighter upon the edges. The head of the viper is heart-shaped, the base being backward. In front, it terminates in a kind of snout, which is prominent and turned up. A large trapezoidal scale covers the part; other scales, those which protect the eyes, are of some size, the rest being all small.

The jaws of the viper are armed with little teeth. In the upper one are two larger than the rest, one on either side, which are called its *poison fangs.* These fangs are curved, their concavity being turned upward and backward, the convexity forward and downward; they are movable from before backward. Interiorly, they are perforated by a canal which opens by a narrow slit upon the convex surface of the fang near the end. This canal is always filled with a yellowish transparent fluid, which is the venom; it commu-

* In Professor Gibson's Treatise on Surgery, will be found the mention of a case in which the sting of a wasp (*vespa*) produced death in fifteen minutes; and another, in which it resulted from injury to the œsophagus, by incautiously swallowing a bee (*apis mellifica*). He likewise quotes from Dorsey's Surgery, an instance in which death was caused by the sphacelation of a musquito bite. In all such cases, it seems probable that the diffused erysipelatous inflammation engendered by so slight a cause, depends upon a state of constitution previously unsuspected, by which its effects are modified and influenced. As local applications, mud and brandy are often promptly successful.—*Trans.*

nicates, at the base of the tooth, with a vesicle which serves as a reservoir for the fluid, which is secreted by a cluster of glands on either side.

The danger from the bite of a viper is much greater always, when the reptile is strong, active and enraged, and when the venom has been long collected, and is injected in large quantity. The deleterious virulence of the secretion varies also according to other circumstances which depend upon season and atmospheric vicissitude. Generally it is much increased during the warm weather. A very great influence over the result of the infliction of the wound will be exercised by the temperament, both moral and physical, of the person, who is its subject. *Cæteris paribus*, therefore, the effects of the bite of a viper will be at once more rapid and alarming, if it is received in a place which is abundantly supplied with arteries, veins, and nerves, than if it is in a part the texture of which is different; and on the other hand, a bold and robust man will suffer but little from a bite, by which one who is weak and pusillanimous would be more or less seriously affected.

The symptoms which follow the bite of a viper may be said to occur in the following order. At the moment of the injury a sharp pain is felt at the wounded spot, which shoots directly all along the limb, producing a sensation very much resembling that which might be caused by a flash of fire. A livid tumefaction soon encircles the wound, which sometimes extends no further, though it usually involves the whole limb. Phlyctænæ next appear, and a sanious discharge issues from the orifice. After a brief space a soft, pasty, and œdematous swelling succeeds to the original inflammatory tumefaction; the heat of the skin falls perceptibly; it assumes a copperish hue, is veined and spotted with violet blotches; and appears to be taking on incipient gangrene. To these appearances about the wound itself, are superadded constitutional symptoms; the patient's strength fails; oppression about the præcordia, dyspnœa, and vomiting ensue; he is covered with a cold and clammy sweat; the skin becomes yellow and the conjunctival membranes assume the same tinge, their vessels being highly injected. Pain in the epigastrium, delirium, and frequently lypothymia, are indicative of the most imminent peril, of which, notwithstanding the assertion of Fontana to the contrary, death itself is sometimes the termination.*

* See Note XIX in Appendix.—*Trans.*

The first thing to be done on the receipt of the injury, is to surround the limb with a very tight ligature with a view to prevent the further absorption of the poison; always remembering that the ligature must be placed between the wound and the heart. This precaution having been adopted, we are advised by Dr. Barry to extract the remainder of the poison from the wound by scarifying it, and exhausting it by means of a cupping pump, which is to remain on for half an hour. To M. Piorry we are indebted for a case in which the use of these means was followed by the happiest effects. When from the circumstances mentioned above, it is probable that the bite is not dangerous, we think that the use of the pump might be advisable; but if the early symptoms are sufficiently severe to alarm us for the issue of the case, we ought, instead of attempting to extract the virus outwardly, which we are not very certain of effecting completely, to prefer decomposing it within the wound through the medium of cauterization. Perhaps advantage might be gained by a combination of the two measures; that is, having put on the ligature and applied the cupping glass, so as to exhaust the utmost possible quantity of the poison, we might, in serious cases, destroy the remainder with the cautery. For a description of the manner in which this is to be done, we refer to our previous chapter on artificial ulcerations.

The remedies, whose efficacy has been extolled in snake bites, are very numerous; but it does not appear that practitioners in different countries are agreed upon the degree of confidence which the greater part of them deserve. Oil of olives, at first so highly lauded, has not sustained its reputation. The famous case is well known to all, in which Bernard de Jussieu obtained such happy results from the administration, internally as well as externally, of eau de luce, or the spiritus ammoniæ succinatus. The patient, who was a student of medicine, was bitten by a viper, whilst botanizing in the vicinity of the barriers of Montmartre. Jussieu directly bathed the wound in eau de luce, and gave the patient six drops in a glass of water. Lypothymia after a short time supervened, but was recovered from, by a second dose of the remedy. The patient, however, suffered afterwards some very alarming symptoms, which were checked by the occurrence of abundant sweats, effected by the use of the same remedy, two drops of which were taken twice a day in some infusion of herbs. The wound was subsequently dressed with a kind of soap made by shaking up a little

aqua ammoniæ in some olive oil. The cure was perfected on the eighth day. Since the relation of this case (which must have occurred anterior to the year 1777), some others have been added in its support. Two among them may be mentioned, cited by M. Richerand, and one which we owe to Dr. Barry, in which ammonia was given with success. We may then venture to recommend the employment of this remedy, which in viper bites seems always to have succeeded; but it is known to be inefficacious in the stings of the large serpents of the torrid zone, and in those of the rattle-snake in particular.

Numerous means have been put in practice to remedy the injuries inflicted by these reptiles. To Mr. William M. Ireland we are indebted for a recital of five cases, in which recovery followed from the use of arsenic, after bites from the trigonocephalus of the Antilles. Until that time, every person, who had been bitten by this terrible and deadly animal, had always perished in six or seven hours. The arsenical solution used was that of Dr. Fowler. The dose given amounted to *one grain* of the white oxyd joined with an equal quantity of the subcarbonate of potassa, with the addition of ten drops of laudanum, diluted in an ounce and a half of peppermint water. This was given to the patient every half hour for four hours, with the addition of some lemon juice. The wounds were dressed in the usual way with a mixture of oil, turpentine and ammonia. In a case, in which the bite of a *viper* might lead us to dread a fatal termination, we might, failing ammonia, *employ this means;* for prudence sake, however, taking care to graduate the doses, so as not to administer more than the twentieth of a grain at a time, or more than one third of a grain in the same day. We consider, nevertheless, that after a strong ligature has been placed around the limb, it is much simpler to apply the cautery-iron to the wound.*

* The gentleman alluded to in the above paragraph, is at this time a practitioner in this city, of extensive reputation. Such was the success with which his happy prescription was attended, in what had, until then, been considered so speedily and so certainly a fatal occurrence, as not only to baffle medical skill, but to be allowed to prove so without medical interference, that the practice has been noticed in almost every publication of the present day, as one of great future promise; and remains, even now, a standing order of treatment in like cases, in the British force upon the West India station. We have great pleasure in stating that Dr. Ireland's original letter to Mr. Chevalier, will be found in the Med. Chir. Trans. Vol. II. The dose of Solut.

WOUNDS FROM THE BITES OF RABID ANIMALS.

By the names of *rabies canina* (canine madness), and hydrophobia, is meant an affection which is characterized by the most frightful nervous symptoms; the deleterious cause of which would appear to reside in the saliva of the animal which is labouring under it, and which is transmitted, between mammiferous animals, by bites; in other words, by a deposit of the saliva of the rabid animals upon some absorbing surface of a healthy individual. The last appellation has been given it from its having been most usually characterized by a dread of water and of other liquids. Rabies is not alone produced by communication. There exist facts to prove, that under the influence of certain circumstances, it may develop itself in a person who has never been exposed to be in any way inoculated with it. Two varieties are therefore made in etiology; communicated rabies and spontaneous rabies. It is a distinction, however, of no therapeutical value when the malady is confirmed.

Domestic animals, but the dog in particular, are those which most generally extend the disease to man. They take it from one another; and very commonly a rabid wolf, by biting a number of other animals has spread the horrid malady over the whole of a country.

There is no characteristic symptom by which it can be foretold that a bite will be followed by rabies. The only light which we have upon the subject, is the appearance and state of health of the animal before, and particularly after, the accident. If it were to be a stray dog, or a wolf, and had bitten several persons or animals, we might fairly suppose it to be mad.

The symptoms which indicate that a dog has been attacked with rabies, are easily distinguishable. M. Sabatier has drawn his picture with so much truth, and no less eloquence, that we cannot do better than to quote it verbatim.

Arsen. given was administered every half hour in the way described, and in every instance was followed by free purging in a short time, which was judiciously promoted by repeated glysters. No specific effects whatever followed the large doses of the remedy, and only once did vomiting ensue. The caution advised by the author would probably defeat the efficacy of the medicine, which, under the influence of the virus, seems to be perfectly safe in the doses given by Dr. I. The idea was suggested by the composition of the Tanjore pill of India.—*Trans.*

"A dog which is affected with madness, becomes drooping and dispirited; and seeks repose in darkness and retirement. He still uses food, both solid and *liquid*, but in small quantities. He snarls at the approach of persons to whom he is unaccustomed, but still fawns upon his master. He soon experiences a secret uneasiness which compels him constantly to change his place, and he runs from one to the other without end and without object. He hangs his head, and carries his tail closely between his legs. His progress is uncertain, and his steps falter. If he encounters another animal of his own species, he directly pursues it, and the other endeavours to escape; bites him if he catches him, and leaves him as soon as he is satisfied. The sight of water seems greatly to distress him, and he is equally distressed with the sight of strongly illuminated, or glittering objects. The places to which he was accustomed, cease to attract him, and he leaves them to return to them no more. His jaws are covered with a frothy foam, and his breathing is quick and oppressive. His limbs are agitated with convulsive movements. At length he dies."

Rabies does not show itself directly after the bite has been received. Before the occurrence of the symptoms, more or less time elapses, during which the virus remains inactive, and the wound heals in the usual way. This is called the period of incubation. It is of uncertain duration; but generally from fifteen to twenty days. But greater or less irregularity is constantly occurring. Thus, in very young persons, rabies has appeared in six or eight days only; whilst cases are cited, on the other hand, in which several months and even years have elapsed before the manifestation of the malady. When the bites have been allowed to heal without any attention, the rabific virus displays its virulence in the following way. Pain begins to be felt in the wounded part; the healthy cicatrices tumefy, become red, then blackish, often re-open, and a reddish serum is effused. Besides these local symptoms, which are sometimes wanting, general ones ensue: sadness, paleness, depression of mind, shuddering without any known cause, and terrifying dreams which relate chiefly to the bite which had been received. Some writers attach the utmost importance to this symptom, and assert that it announces the invasion of hydrophobia, before any change occurs in the cicatrix. Be this as it may, the patient who has got to this condition, soon begins to display the later effects of the poison; which are convulsions, fits of frenzy, in which the dread

of fluids is observed, spitting, a desire to bite, &c., and he dies in this wretched condition in three or four days.*

From the moment that the existence of this frightful malady becomes confirmed, it is remediless; our business is then, to prevent its development. Local cauterization thus far offers the most certain and effectual means by which to destroy rabific virus in a wound. As a measure of prudence, it should be applied as soon as possible; but experience has taught us, that until the symptoms are developed, it is not too late. It should be resorted to therefore during the period of incubation. For the manner of its performance, we refer to our chapter on artificial ulcerations on page 148. But although cauterization to the spot as soon as possible most effectually does away the tendency to a development of rabies, it does not dispense wholly with consecutive measures. The Germans advise the application of a blister over the wound, which is to be made to suppurate for six weeks after the fall of the eschars; they moreover recommend the use of certain diaphoretic medicines.

Narcotic remedies have been recommended with a view of allaying the high nervous irritation which exists; but it may be presumed, from their impotence in confirmed rabies itself, that their influence in preventing its development can be but insignificant. Of bleeding ad deliquium, the same may be said; it has never done good in rabies, but in conjunction with other means.

The expectoration of hydrophobic patients, and the fact of the communication of the malady by the saliva or foam of the animal, long ago gave rise to the idea that an increase of the salivary discharge might be attended with good effects; hence mercurial frictions have been advised as means of prevention.

Finally, it appears by numerous facts gathered in Germany, that abundant evacuations from various surfaces, but in particular by salivation, aided by *cauterization by fire upon the cervical region, between the atlas and the axis*, have sometimes been successful in arresting the effects of confirmed rabies; by which, it would appear, that to a certain extent, this disease may be treated in a manner analogous to other nervous affections.

Two modes of treatment yet remain unalluded to, which we cannot permit ourselves to pass over in silence. The first is that of M. Magendie. This celebrated physiologist, having noticed that an

* See Note XIX, in Appendix.—*Trans.*

injection of a large quantity of tepid water into the veins was followed by a state of obtuseness and relaxation in the energy of the nervous functions, conceived the ingenious project of making the experiment in a case of confirmed hydrophobia.* He subjected a rabid and furious dog to the trial, which had so happy an effect, that the animal grew calm directly, and fell asleep; unfortunately, however, it died in about five hours, from a congestion of the lungs. Since then, this injection has thrice been performed upon the human subject. In one person, M. Magendie introduced in the veins on the fore-arm, two pounds of water at nine different intervals; the whole operation lasting twenty minutes. In half an hour more, the violent symptoms disappeared and were not reproduced. It is much to be regretted that the man died in a week afterwards, of an occurrence which the rabies in itself had no agency in causing. In the two other cases, one by M. Gaspard, no conclusive result could be obtained, trifling circumstances having interfered with the injection of a sufficient quantity of water. New instances therefore, must be awaited, before the question can be decided.

The second mode of practice is founded upon a new fact in pathological anatomy, and is entitled to the attention of every practitioner. We shall not enter into details, which would cause too great a digression, but will merely state the leading facts with brevity.

M. Marochetti being in Ukraine in 1813, fifteen persons were brought to him who had been bitten by a mad dog. When he was about to prescribe for them, the inhabitants requested him to place them in the hands of a Russian peasant, who had the reputation of treating the malady with success. M. Marochetti did so; but reserved a young girl as a counter-experiment, whom he himself treated, locally by cauterizing the wound, and internally with calomel, opium and camphor. She died; and the fourteen persons who had been confided to the Cossack peasant did well. M. Marochetti has since employed the Russian method thirty-six times, *and always with success*, but he has combined with it the application of a blister to the bite, and local lotions of a decoction of the genista or broom. The following is a summary of his opinions.

Rabies produces an eruption of pustules under the tongue; which usually appear from the third to the ninth day after the bite. Sometimes they are not perceptible until the thirtieth, fortieth or fiftieth

* See Note XX, in the Appendix, for some remarks upon transfusion.—*Trans.*

day. Two or three are generally seen, and sometimes more. They are situated on both sides of the frenum linguæ, nor are they uncommon upon the lips, and around the wound. Their appearance is crystalline, opaque, of a bluish white, or dirty grey; their surface is sometimes smooth, but generally surmounted with little excrescences. They are pisiform or lenticular, seldom ovoid; their apex is perforated by a small orifice resembling that in a dilated folliculus. These pustules fluctuate at maturity. When opened, they give issue to a sanious liquid of a yellowish white, and sometimes greenish hue; if neglected, this contained liquid is reabsorbed, and acts upon the nervous centres. Rabies then makes its attack.

Rabific pustules are sometimes wanting; and are then replaced by ecchymosis, or redness and dryness under the tongue, at the velum palati, and at the pharynx. They should be looked at twice every day. As there appear little excrescences or pimples, they should be opened with a lancet, and then cauterized with a thick metallic wire at a white heat. After each cauterization, the patient is to gargle with a decoction of dyers' broom, (*genista luteo tinctoria*). The operation must be repeated as often as pimples appear. At the same time, the patient is to take internally a decoction of the above plant every day, in the proportion of an ounce to two pints of water. Another ounce in powder is to be taken at four times, on slices of bread; and if this is refused, it must be replaced by the decoction.

Such are, in substance, the pathological facts, and the novel treatment which M. Marochetti has announced. No great confidence was at first assigned them, as the accounts given were followed by some very marvellous recitals. But inasmuch, as several practitioners in France and in Italy, have since seen these rabific pustules, and assert that they have had reason to be pleased with the adoption of the treatment he has laid down, we have felt it our duty to lay before our readers a brief exposure of the facts, for the authenticity of which, however, we are by no means committed. We would not however advise the surgeon to await the pustular development, but if he is consulted by a patient who has been bitten some time, it will be well, besides cauterizing the wound in the usual way, to look under the tongue for several days, to be certain either of their absence or their presence; and if they did present, we might treat them in the way recommended.

BURNS.*

This name is given to diseases which are produced by the instantaneous transmission of a very great quantity of caloric through living tissues; and they are caused by contact with, or approach to a body in a state of ignition, or heated to a degree of temperature more or less elevated, but always much beyond that of the human body.

Burns differ from one another in a number of circumstances, the principal of which, in a therapeutical point of view, are the extent of surfaces which they attack, and the depth to which the heat has extended its action. Upon the intensity of these two effects, upon their isolation, or their complications in different degrees, the serious nature of these kinds of diseases depends.

The extent of burn upon the surface, will much depend upon the way in which the accident occurred. A metallic body seldom burns but in a limited extent. The flame resulting from the deflagration of gunpowder, catching fire of the clothes, and the access of boiling liquids or steam, produce on the contrary, an instantaneous effect upon a very considerable extent of parts. The first two causes are always productive of very dangerous burns, for the action is at once extensive in surface and depth; boiling water generally, only involves the superficies of the skin. Superficial burns, when unextensive, are not dangerous; but when they are very widely spread, give rise to the most alarming nervous symptoms, owing to the pain by which the irritation of the plexuses in the rete mucosum is accompanie d

The depth of a burn depends upon the amount of heat contained in the ignited substance, and the length of time for which it was applied. Authors have classed burns according to this circumstance; that is to say, according to the number of tissues involved, and the varieties of disorganization which have been produced. From these characteristics, the danger of burns, and the therapeutical indications they present, are deduced.

By a division formerly sanctioned, burns were said to be of three classes: first, that in which the burn had merely irritated the skin; secondly, that by which the texture of the skin had been destroyed; thirdly, that in which the skin was reduced to carbon, and arteries, veins, muscles, and subcutaneous tissues, were found more or less disorganized.

* See Note XXI. in the Appendix.—*Trans.*

M. Dupuytren, without subverting this classification, thought it susceptible of such extension, as better to mark the intermediate gradations of cases. He makes in burns, six degrees: viz., rubefaction, vesication, sloughing of the rete mucosum, that of the derma, of the muscles down to the bones, and lastly, the entire combustion of a limb.

Rubefaction, or the erythematous, is the least of these degrees in severity. It is a kind of artificial erysipelas. It differs in no respect from that which results from any other cause, and is produced by a lengthened exposure to flame, and to the sun's rays, and in females, by the use of foot stoves. Water at 50° or 70° cent., thrown upon a limb, is merely productive of this effect. Rubefaction, spreading over a great surface, might create nervous irritation enough to cause death; but, after the first day, resolution takes place, and the danger diminishes in proportion.

Blistering is the effect of a cause somewhat more energetic, and is productive of severe pain; particularly when, by the phlyctænæ being torn, the nervous expansions of the skin are placed in contact with the air. Its effects are the same as those of rubefaction when the burnt surface is not large, and sometimes it is attended with symptoms of gastro-intestinal irritation.

In the third degree, there is necessarily an eschar. This circumstance prolongs the cure, which cannot end by resolution, but must go on to suppurate. If a burn of this kind is extensive, that is, say a foot square for instance, it is unavoidably followed by gastro-enteritis. This disease, which with equal certainty attends a burn of the fourth degree, is always extensive in a ratio equal to the extent of tegumentary surface which the injury involves. This very extraordinary complication is worthy of the undivided attention of every practitioner. It appears to be owing to the very close sympathy which unites the inner gastro-pulmonary mucous membrane with the outer tegumentary tissue; by which, the one cannot primarily inflame, without the occurrence of consecutive inflammation in the other. That it does not follow burns of the first and second degrees of severity, is because the speed with which the cutaneous rubefaction disappears by resolution, prevents its development. This sympathetic co-relation in artificial inflammations of the skin ought not to create surprise, when it is remembered, that it is equally an attendant on natural phlegmasiæ of that membrane. It is familiar to all that gastro-enteritis is the most

dangerous of the complications of erysipelas and variola, of all cutaneous affections the most to be dreaded; and that the mildest of these affections, measles for instance, is always attended with symptoms of irritation in the mucous membranes, and particularly in that which lines the alimentary canal.

In burns of the third and fourth degrees, we must, before the wounds can possibly cicatrize, await until the eliminatory inflammation has separated the sloughs from the living parts. The size of a slough is always a little larger than that of the portion of integument which has been disorganized. The deeper the cauterization has been, the longer the inflammatory action is in developing itself. In a burn of the third degree it appears directly, or in about twenty-four hours. In one of the fourth degree, not, very often, until after several days. Besides this, the manner in which the fire exerted its action, has a great influence over these phenomena. The slow disorganization which is produced by the long continued contact of a moderately hot body, because it is more irritating, is followed by reaction almost immediately. But when the cauterization has been caused by the rapid application of a substance in a state of incandescence, an inverse effect ensues. The eschar then is dry, and the integuments wrinkled and crisp; and reaction does not set in for several days. We have seen this effect to be brought about by the employment of the moxa, and the red hot cautery iron. The danger of burns of the third and fourth degrees is always proportionate to the extent of tissues involved, and death results from three causes: intensity of pain, abundance of suppuration, and the complication of an inflammation of the stomach and bowels.

The phenomena of burns of the fifth degree, are, except that they are much more marked, the same as those which we have already enumerated. Death is the almost inevitable result of a burn of this severity. The same may be said, with even greater certainty, of one extending to the sixth degree. The impossibility of effecting a separation of the sphacelated parts, the intolerable pain, and the profuseness of suppuration, almost necessarily bring with them the loss of the patient. In such a case, instead of allowing the sufferer to linger on in unavailing anguish, it is better to amputate the limb without delay.

OF THE TREATMENT OF BURNS.

A great many therapeutic measures have been advised by authors for the cure of burns. Although the various plans are exceedingly different in themselves, and in their modes of acting, they are all designed to fulfil one common object: that of preventing, in burns of the first or second degree, the occurrence of pain and inflammation; and, in those wherein an eschar has been formed, to diminish the violence of the subsequent symptoms, lessen the abundance of suppuration, and even to prevent it, when the extent of injury is but slight. These modes of treatment we proceed to enumerate.

1st. *By the use of Fatty Substances.* Many persons are in the habit of covering a recent burn with cloths dipped in olive oil, or a soap of olive oil and lime water, or spread with cerate. The plan cannot, in itself, be hurtful; but it is an insignificant one, and cannot produce any other effect than that of preserving the parts burned from friction.

2d. *By means of Heat and Stimulants.*—Fire has been resorted to in the cure of burns in almost every age. Persons, who from their occupation, are exposed to be burned frequently, such as cooks, glass-blowers, blacksmiths, and the like, expose for a while the injured part to the action of a brisk fire; a means which we have often seen employed. The cuticle and rete mucosum become rough and horny; but in the mean time the pain ceases, and no inflammation ensues. After some time, the slough separates without suppuration, like, for example, a corn. However, this re-cauterization will only do in burns of very small extent, and even then, it is so painful that few will venture to resort to it.

Dr. Kentish, in England, erected a complete system in therapeutics, upon the use of excitants in cases of burns. In the theories promulgated by this physician, none place confidence; but by the adoption of his mode of treatment many successes have been obtained. He again exposes the burn to the fire. When from the seat of the injury this cannot be done, he applies repeated lotions of rectified spirit of wine, heated as highly as the patient can bear. Meanwhile, he employs internally a stimulant treatment, by which to elevate the whole system to the same pitch of excitation as the wounded part. Next, he gradually lessens the heat and strength

of his alcohol, and progressively lowers the state of excitement, general as well as local. He concludes by an antiphlogistic course of treatment, during the period of suppuration.

We cannot, we confess, conceive the great advantage with which this method can be employed, since in fact, the stages of irritation, inflammation and suppuration, must be gone through, as much as if the disease had been let alone; and in addition to this, high stimulation and symptomatic fever are created, capable of producing fatal consequences, without, as far as we see, any advantage resulting to the patient. For our own parts, the treatment appears dangerous, and liable to induce fatal congestions; and, even though this should not occur, likely, by exhausting sensibility, to hasten the period of debility.

3d. *By means of Refrigerants.* Compresses steeped in very cold water, or bladders filled with a mixture of water and of pounded ice, have at all times been applied to burned parts. We have seen the latter means used with the utmost success in several instances; in one among others at the Hôtel Dieu, upon a young child, who had his whole face burned by an explosion of gunpowder. Cold applications are only proper to the head, and upon the limbs. Over the chest and abdomen they may induce rigors, which may prove to be the forerunners of visceral inflammation. The action of the ice, moreover, should be attentively superintended, lest it produce congelation. Therefore, from time to time, its use should be suspended, and compresses dipped in cold water substituted for it. Refrigerant applications are one of the best means that can be resorted to in the cure of the species of injury now under consideration; when these are but of first and second degrees of intensity, they put an end to the pain and inflammation. The disease generally ends, in the last of these cases, by desquamation of the epidermis without vesication. When an eschar has been produced, if it is very limited, it dries, and falls off in twelve or fifteen days. But, should it extend to an inch square, or beyond it, it must necessarily suppurate, and the eschar must be detached, as is the case with every one to which cauterization gives rise.

4th. *By the use of Astringents and Repellents.* The class of remedies now named have ever been those most resorted to in the treatment of burns. Many writers recommend the application of compresses steeped in a weak solution of alum, sulphate of iron, or of the acetate of lead. The latter substance is an ingredient also in an oint-

ment much employed in similar cases, called *Goulard's cerate*, (see page 87). Among vegetable remedies, all which contain tannin or gallic acid are frequently made use of, such as nutgalls, pomegranate bark, bistort root, oak bark, &c. used as cold decoctions.

All these means have been repeatedly successful, when employed immediately after a burn; all equally tend to prevent the development of inflammation, when the disease has not passed the limits of the *second* and *third* degrees. They have, in these cases, the effect very frequently of completely subduing the inflammatory reaction. This effect is promoted by combining them with the less powerful narcotics, such as the leaves of the belladonna, or the capsules of the poppy. Nature has furnished us with a compound in the raw potatoe (*solanum tuberosum*), (see page 56), which seems happily to unite these various qualities. Under the head of cataplasms we alluded to its use when scraped. We confidently assert that we have often used it, and always with the happiest result. The only precaution demanded for securing its best effects, is to renew the poultice every time that it becomes heated and dry.

Such are the different courses adopted in the treatment of burns. In our estimation, that in which astringents and refrigerants are employed, is the best. But, whatever be the plan which we decide to pursue, it can be successful only in the first three degrees of the malady. When the cutis vera is involved in the eschar, and, *a fortiori*, in proportion to the depth of its extent, the remedies, which in slighter cases dispelled the inflammation and suffering, serve but to moderate their intensity; whence it follows, that in the last three degrees of violence, the different methods of treatment can only apply to the two periods of irritation and of inflammation. As soon as the discharge of pus sets in, which is to cast off the slough, the only rational treatment will be to lessen the inflammation by anodyne and emollient poultices, and by general antiphlogistic measures. The surgeon must then direct his undivided attention to encountering the gastro-enteritis which attends upon burns of this serious nature and extent. As the period of suppuration progresses, the sloughs come off like flakes, first yielding at the circumference, and adhering for a longer time at the centre. Their total expulsion should be left to nature; for it has been proved by experience, that the connections often consist of vessels and nerves, to cut which might be productive either of severe pain, or hæmorrhage. Generally speaking, the critical period for a patient labouring under a

burn of much size, is that of suppuration. Very many fall victims either to the abundance of the discharge itself, to the complications of disease with which this stage is attended, or to the extreme exhaustion of the vital powers by which it is succeeded. It is impossible for us to enter upon the modifications of treatment which each of these occurrences may require.

Not less than in any other, is a strong claim made upon the attention of the surgeon during the period of cicatrization. There is, properly speaking, no cicatrix in burns of the first and second degrees, as the disease goes off by mere desiccation; in the third degree it scarcely leaves any very distinct appearances; but when there have been formed deep sloughs, it tends, by compelling a forced approximation of the edges of the wound, to form ugly and narrow seams, and to produce adhesions between contiguous parts, such as the fingers, for instance, when the corresponding surfaces have suppurated. It is the duty of the surgeon, whilst the cicatrization is going on, to oppose this vicious tendency of parts towards union, and by keeping them asunder, to compel nature to supply the loss of substance by an adventitious cutaneous tissue. To this end, adhesive strips, bandages and position are resorted to.

The *position* ought to be such as that the skin shall be kept in a state of tenseness. This is much more necessary of observance, when, as in the folds of joints, the parts, from structure and accustomed motion, tend to come in contact. On the contrary, it becomes less imperative in places which possess but little motion, and in which the integuments adhere to the subjacent parts by a dense cellular tissue, as for example, upon the lateral surfaces of ginglymoid articulations. Generally, burns upon the posterior surface of the neck and trunk, and on the surfaces of limbs which correspond with their extension, get well of themselves, without contraction of the skin; because the semiflexed position, which we naturally assume in repose, is the best suited for maintaining the integuments apart.

We cannot here enter into the subject of the method of making bandages suited to burns, according to their different situations; nor do we, indeed, conceive it necessary to lay any stress upon it, for nothing can be easier than to construct an apparatus, when the object for which it should be applied is understood.

Strips of adhesive plaster are frequently employed, especially when the burn is upon a part in which we cannot obtain the advantage afforded by position, as, in particular, burns upon the face. It

is said, however, that adhesive strips oppose but feebly the power with which the integuments tend to approximate. We think this inconvenience to be owing more to an injudicious method of applying them, than to any want of resistance. They are laid on across the wound, their ends reaching from one of its edges to the other. The wound, by contracting, must evidently draw the adhesive strip with it, and its ends will bend up towards the centre. It is much more rational to apply them in the opposite way. Let us take, by way of illustration, a burn upon the lower part of the cheek; its transverse adhesions may be resisted by one, or several strips of plaster, which being applied at one end, on one edge of the burn, will cross the lips, over the sound cheek, behind the nucha, and be fastened at length upon the opposite edge of the burn. Approximations in the direction of the vertical diameter will be as easily resisted by a series of strips, some of them extending from the upper edge of the injury over the cheek and temple, and others from the lower edge of the wound, beneath the jaw and upon the neck. Applied in this way, it is manifest, that adhesive strips will very efficiently oppose any approximation of the edges of the burn, and we can assure the reader, that by this means, we have many times succeeded in obtaining a wide cicatrix with an even surface.

ULCERS.

An ulcer is a solution of continuity in a part, kept up by a cause which is either local or general.

An ulcer, from being always symptomatic, is easily distinguished in this respect from a wound, which is always idiopathic. But there is, according to authors, another and a very characteristic difference between the two species of lesions; a wound tends to get well of itself upon the removal of all local irritation, whereas an ulcer remains stationary, or progresses, so long as the cause by which it is maintained is yet unremoved; from whence it follows, that the treatment of wounds will be mostly surgical and mechanical, whilst any of the means for the cure of ulcers must be borrowed from the science of medicine. Still, it is very difficult, with all the accuracy which we may employ in framing a strict definition by which an ulcer is to be distinguished from a wound, to delineate a well marked line of separation; for amongst ulcers which have a local origin, many are nothing but old wounds which have undergone long continued irritation.

The nature of the general or local cause permits of the division of ulcers into two great classes.

To the first belong *fistulous* ulcers, *callous* ulcers, *varicose* ulcers, *fungous* ulcers, *warty* or *verrucous* ulcers, *verminous* ulcers, and *cancroid* ulcers.

The second comprises, the *scrofulous*, the *syphilitic*, the *scorbutic*, the *dartrous*, the *psoric*, the *cancerous*, and the *cachectic* ulcer.

Each of these ulcers may be simple or complicated. An ulcer is a *simple* one, whenever, being reduced to its own particular state, it offers no other risk than that to which its existence exposes, beneath the influence of the cause by which it is kept up. An ulcer is *complicated*, when there is superadded to it some local malady, such as excessive inflammation, hospital gangrene, mortification, or any constitutional disorder whatever.

Ulcers are situated upon either of the tegumentary surfaces, the skin, or the mucous membranes: the skin may be affected with ulcers of every kind, and from either local or general causes; but a mucous membrane is not commonly attacked with others than symptomatic ulcers from a constitutional cause.

ULCERS OF LOCAL ORIGIN.

Many parts of the body will be found to be affected with ulcers of this sort; but owing to the constant irritation of walking, the legs and the internal malleolar region especially, are particularly liable to their invasion. The dimensions of these ulcers vary exceedingly; their extent is generally in proportion to the length of time for which they have existed; and the widest are oftenest encountered in the old. The quantity of pus which they supply, does not always depend on their width; the length of their standing most influences them in this respect. Newly formed ulcers suppurate profusely; those again, which have lasted for a number of years, yield little more than a trifling exudation. The nature of the original cause, temperament, regimen, habits of the patient, &c., infinitely vary the progress of an ulcer, as also the quantity and qualities of its secreted fluids.

The cure of ulcers calls for particular care on the part of the surgeon. It has been from time immemorial acknowledged, that the influence which, after long continuance, they exercise over the general well-being of the patient, has converted them into a sort of natural issue, which cannot be suddenly suppressed without danger.

When, therefore, we design to effect the cure of an ulcer, we must subject the patient to diet and regimen; he must be directed to the use of purgative medicines, with a view to establish derivation from the intestinal canal; and if the ulcer is a very old one, it would even be proper to establish elsewhere an artificial drain to supersede it. These precepts will be doubly obligatory, if the patient have, besides the ulcer, any organic affection of an important viscus, as it might then be justly apprehended, that the progress of inflammation would be quickened by the cure of the ulcer, and the suppression of the discharge. In such a case, the advice given by the majority of practitioners has been, not to interfere with the latter malady unless it should give rise to a suppuration so abundant as to wear away the patient's strength; and even then, they lay it down as a rule, not to cure the ulcer entirely, so as to leave a natural issue for the

benefit of the original disease. If, after the healing of an ulcer, an organic disease were to be developed, of a kind which might legitimately be attributed to the suppression of the former, we ought quickly to reproduce the ulceration, by the application either of caustic or a blister over the cicatrix.

FISTULOUS OR SINOUS ULCER.

Unless this is the result of detachment of integument, it is usually nothing more than the outer orifice of a fistula kept up from some cause or other. If the first be true, an incision of the detached portion of integument and judicious compression are in general all-sufficient to bring about the cure. Under every other circumstance, we must remove the cause which gives rise to the fistula.

CALLOUS ULCERS.

This name is given to ulcerations, the edges of which are hard, elevated, pale or bluish at times, and at others red, in proportion to the degree of irritation. The surface of the ulcer is more or less wrinkled or smooth; it consists of fleshy granulations, which are wide, flattened, and separated by little cavities which contain a fetid pus. This surface, owing to the elevation of the edges, is made to seem much deeper relatively to the level of the neighbouring integuments, than is really the case. The tumefaction of the skin by which the callosity is caused, has been attributed usually, to a deposition of concrete lymph in the areolæ of the dermoid tissue. M. Boyer regards this morbid condition as the result of a series of successive inflammations, each of which has ended in induration. Callous and varicose ulcers, are the two most frequently met with in practice. Old men are generally the subjects of them: and their most usual localities are on the legs, and in the neighbourhood of the ankles. They very often result from simple excoriation, of which timely care was not taken. In adults they are oftenest seen in persons who are compelled from their occupations to stand much on foot, and whose feet are much exposed to moisture. Their extent is generally proportionate to their antiquity, and among the lower classes, it is not uncommon to see them occupy two-thirds of the whole leg, and of twenty-five, thirty, and even forty years duration.

Numerous and conflicting treatments have been extolled for the management of callous ulcers. The chief indications which they

offer, are, on the one hand, to destroy the callous edges, and on the other, to effect cicatrization in a surface upon which a large loss of substance has been sustained.

In the greater number of the Parisian hospitals, callous edges are softened by means of emollient poultices, either by themselves, or aided by cushions of lint spread with the balm of Arcæus. They are then dressed with dry lint; and by degrees, an adventitious cutaneous tissue takes the place of the ulcer; when the cicatrix is quite closed, a compressing bandage is made use of. This method frequently succeeds; but the cicatrix is often a very long while in forming, is too extensive, cracks upon the slightest cause, and the ulcer is re-produced. Irritant plasters, into which oxides of lead and copper enter, are frequently employed to re-animate the surface of atonic ulcers. They should not be prescribed until the previous application of the poultices has altered the callous edges.

Sir Everard Home asserts that cicatrization is speedily effected by using, under the form of lotion upon the surface of the ulcers, either a weak solution of nitrate of silver, or a mixture of a scruple of nitrous acid in eight ounces of water. According to this gentleman, the cicatrix, which is obtained from the last of these remedies, possesses greater solidity than that which is effected by any other mode of treatment whatever.

Compression is one of the therapeutic agents from which the most favourable results have been obtained. The treatment adopted in France by M. Gaillard, is well known. The successful cases which this practitioner has managed, have gained many partizans for his method; but the very unreasonable advice which he has given, has raised up against him a host of antagonists. M. Gaillard dresses the ulcers with irritating ointments; then encircles the limb with a compressing bandage; and instead of recommending repose to his patients, insists, on the contrary, upon their exercising on foot. We question very much whether the last prescription be calculated to improve the success of his treatment.

In England, Mr. Whately first dresses the ulcer with some plaster of which lead is the basis, and then makes pressure upon the foot and leg with a flannel bandage three inches wide, and five or six yards long. The bandage, which must be adapted with great accuracy, envelopes the limb by two series of turns, one set reaching

from the end of the foot to the upper part of the leg, and others, in a contrary direction, descending from the upper end of the leg towards the ankles.

Of a third mode of treatment, very much used in England, Mr. Baynton is the inventor, and it is beginning to reckon a great many advocates in France.

Mr. Baynton's treatment consists in bringing the edges of the ulcer together with adhesive straps. From this, results the twofold advantage of obtaining a narrower, and therefore a much firmer cicatrix, and of facilitating extremely the adhesion.

The straps used are about an inch wide, and one and a half times the circumference of the limb in length. They not only cover the whole extent of ulcer, but extend for twelve to fifteen lines beyond it below, and for two or three inches above it. The application of them begins at the lower part of the limb. The following is the method of using them; the limb being shaved, washed and dried, we take the strip of plaster by its ends, between the tips of the fingers of either hand, apply its centre to the surface of the limb which is opposite to the ulcer, and bring the two ends round on the other side, with the exertion of moderate pressure. We then cause one end of the strip to adhere beyond the ulcer, and lay the other end upon the first in such a way as that it shall cover about one half of its width. If the manipulation has been well understood, it will be at once perceived that the strip of plaster brings the parts together from different directions, from the point which is diametrically opposite to the ulcer towards its centre; besides which, its action is increased by the two ends of the strip, which are attached on different edges. All the bandages are applied successively according to the procedure which we have now laid down for the first. The dressing is completed by the adaptation of some compresses to the limb, which are kept on by a spiral bandage.

Such is briefly the contrivance of Mr. Baynton. If suppuration is very profuse, the dressing may be renewed every day, or even twice a day. If the part is the seat of any inflammation, he advises the use of lotions of cold water, and he is also of opinion that moderate exercise dispels the pain and expedites the cure. Besides the benefits derived from an approximation of the edges of the ulcer, the author states, as another result of his practice, that it causes callous edges speedily to disappear, and that it prevents the occurrence of fungoid granulations.

VARICOSE ULCERS.

These ulcers are almost as common as the preceding species. They are likewise often combined; for callosity is one of the most common complications of ulcers of long duration.

The disease particularly designated by the name of varicose ulcer, is either the result of the accidental or spontaneous rupture of a varicose vein, or of the erosion or wound of integument situated in front of a tumour of that kind.

It is not at all uncommon among the lower classes of the people, for a simple excoriation, angered by filth, walking, and the friction of woollen garments, to turn to an ulcer, and from a simple one to become callous. When it has reached this condition, the impediment offered to the circulation creates local congestion, the veins dilate, and the ulcer becomes varicose.

The leg, particularly in the course of the vena saphena interna, is almost the only locality in which this form of ulcer appears. The characteristics of the disease are a red or violet colour, it seldom discharges much pus, but what there is, is frequently bloody. The discharge of blood is sometimes sufficient to constitute a real hæmorrhage. We were acquainted with a case in which a female perished from an occurrence of this sort, the ignorant surgeon to whose care she had committed herself, not having known how to arrest the flow of blood.

It is in general easy to obtain the speedy cure of a varicose ulcer, but it is very liable to recur. If inflammation is present, it is to be allayed by emollient topical applications, and by resting the limb in a horizontal posture.* When this is reduced, the ulcer is

* A very convenient apparatus for reposing a limb upon which is ulcerated, strained, or otherwise injured, consists of two pieces of board, each 12 inches wide; the longest being 2 ft. 6 in., the shortest 18 in., in length. The short one is nailed perpendicularly to the flat surface of the longer, to form a T; but at a distance of 2 *in. nearer one extremity* than its centre. The vertical piece is furnished with an opening, for the greater convenience of its transportation, and the whole may be painted, or covered with moreen. When it is to be used, the flat, long piece is raised perpendicularly, by which that wherein the handle is, is placed horizontally, and parallel to the floor. The leg is then laid upon the horizontal piece, which, according to the side that is uppermost, elevates it more or less. The foot rests against the vertical board, which is steadied in that way. The comfort of the *leg-rest* is much increased by stuffing the horizontal board on each side.—*Trans.*

dressed flatwise, and compression made with a roller bandage put on spirally, or else with a laced stocking of dressed dog's skin, or of thin ticking. In cases, finally, in which large varices exist, which are likely to re-produce the disease, we ought, to make the cure more certain, to attend to the treatment of the varix itself. We shall not undertake the description of the serious operations designed for this purpose.

FUNGOUS ULCERS.

This is the name which is given to powerless ulcers, the surface of which is studded with fleshy granulations, which are wide, flattened, single or conglomerate, adhering by bases now broad and again pedunculated; which fleshy masses have been called fungosities, or fungous growths.

They make their appearance either in very much enfeebled persons, or under the influence of some cause which produces great relaxation of the tissues: such is particularly a use of emollient remedies too long persevered in, in lymphatic subjects.

For the cure of fungosities, various treatments are in use among practitioners. When they are fresh and soft, pressure kept up on their surfaces with a thin plate of lead, &c., supported by a compress and a spiral bandage, is sufficient to cause them to disappear. But in proportion as they assume consistence, more energetic measures are demanded for their cure. The different caustics are then resorted to for that purpose; and among them, fire, lunar caustic, and the potassa fusa, are the preferable ones. It is always better to resort at once to some active measure, by which, at a first or second application, the fungous granulations may be removed, than to trifle with feeble escharotics, the repeated applications of which merely engender a chronic irritation, too often succeeded by carcinomatous degeneration.

When old fungosities are at once projecting, hard, and adherent by a narrow peduncle, we may remove them by the ligature; if not, they should be excised. Indeed, our own opinion is that the latter measure, which is more quick and less painful, is better than the ligature, even when the use of the latter seems to be called for by the shape of the tumour.

The existence of worms or maggots upon the surfaces of ulcers, has occasioned them to receive the appellation of *verminous*. This occurrence cannot with propriety constitute a separate genus. It

is never met with but in the filthy, and the old and feeble particularly. To put a stop to it, it is merely necessary to apply stimulating lotions to the surface of the disease, such as decoctions of tobacco, bark, garlic, &c., or very weak solutions of chloride of lime or soda; and care must afterwards be taken to keep the ulcer clean.

CANCROID ULCERS.

These are of two sorts: primitive and consecutive. The primitive species we have described in the article on artificial cutaneous ulcerations, (see page 152). Consecutive cancroid ulcers result from degenerations of every other variety of the disease now under consideration, which have been long irritated by any cause, and particularly by reiterated applications of caustics. The edges of these ulcers are hard and unequal; their surfaces are irregular, greyish, and studded with fungosities, some very firm, others very soft, and bleeding on the slightest friction; the neighbouring integuments assume a purple, or else a dusky brown hue, and resist the touch; they are furrowed by bluish streaks, which are merely subcutaneous veins in a state of dilatation.

In this condition of things, it is far from certain that the patient cannot be cured by appropriate treatment; and particularly when he is the subject of any constitutional malady. We are then to remove the causes of irritation, to treat the ulcer locally by emollients and narcotics, and submit the patient to such a course of remedies as is suitable to the kind of complication, to which we suspect the ulcer to be owing. If, in spite of these precautions, it continues to spread, it must be extirpated with the knife, and we should then complete the destruction of it by fire or caustics, and of every part which has participated in the carcinomatous degeneration; only, being cautious, when the surface of the ulcer is extensive, to avoid making use of any escharotic which is capable of producing dangerous effects when absorbed. Nitrate of mercury or the caustic potassa would, upon this account, be preferable to the arsenical paste. The eschar being detached, and the surface of the ulcer restored to the state of a simple wound with loss of substance, its cure may easily be effected by the method previously detailed.

ULCERS FROM AN INTERNAL CAUSE.

Ulcers which result from the diseases called lues venerea, scro-

fula, herpes, carcinoma, scorbutus, and the like, have received the various names of venereal, scrofulous, &c., because each of them is considered as a symptom of some special malady. Their treatment, upon this principle, is, as was before shown, rather an appurtenance of physic than of surgery.

The forms which these ulcers assume are so varied, that to describe them would be to enter into the history of each of the affections to which they belong. They are not always to be detected by their peculiar characteristics, and it is often necessary, in order to discover their nature, to resort to signs which are commemorative. Thus it is, very often, that one surgeon obtains the speedy cure of an apparently irrecoverable ulcer, by general treatment and proper regimen, which could not be effected by his predecessor, from his considering it merely as a local malady.

We cannot depart from the path to which we are restricted, and enter into the details of all these various maladies; and we dispense with doing so with greater readiness, that we may avoid the discussion of the great question of the existence or non-existence of *virus*, which many practitioners at the present day incline to disbelieve.

OF ABSCESSES.

The word abscess, taken strictly in its old surgical acceptation, meant any collection of pus in an *adventitious* cavity. Its signification has recently been extended to include collections of matter formed in some point of the great natural cavities, and limited by adhesions; in opposition to the extensive effusions which occupy the entire of these parts of the body. Thus the circumscribed collection formed in a limited portion of the pleura, by assuming the name of abscess, is distinguished from empyema, properly so called.

An abscess, whatever be its nature, or wherever its seat, is always the product of an inflammation; for that cause alone can give rise to the secretion of pus.* The inflammation by which this fluid is generated is called *suppurative*, in contradistinction to other varieties which terminate in resolution, delitescence, &c.

There are, in every abscess, three very distinct periods. The

* The merit of proving that pus is a peculiar secretion, belongs to the zealous and ingenious Mr. Hewson, who likewise established the fact that it is sometimes secreted without abscess or ulceration. The characteristics of pus are: it consists of white globules swimming in serum; it coagulates in saturated solutions of the mur. ammoniæ; it has a sweet and mawkish taste, and a peculiar smell; after putrefying, or long exposure to a' , it becomes slightly acid, and affects vegetable colours; its specific gravity is greater than that of water, and it therefore sinks when poured into it; it blends also intimately with it; when dissolved in the liquor potassæ, it falls in a kind of precipitate, and in each of these latter effects, differs from animal mucus. It is a mild and soothing covering to the surface of sores; it is a means of removing foreign bodies; it acts as a solvent upon the outer layers of dead animal matter, which it renders fit to be acted upon by the absorbents, and removed; when, there exists a cavity, where there was before a solid substance. It has been thought, lastly, to render a particular service in assisting granulation; that of forming a fomes for the production of new vessels. *Sir E. Home. Phil. Trans.* 1818.—*Trans.*

first is the period of *increase*, in which the pus, as fast as it is secreted, collects in one cyst, and puts asunder the neighbouring tissues. The second is called the period *of state* or *completion*, and is that wherein the pus collected causes a tumour, which interferes more or less with the functions of the parts. If the abscess is subcutaneous, the tumour projects, and offers to the touch a sense of fluctuation. The third and last period is that of *termination*, in which the pus is reabsorbed, the disease ending in resolution; or else it tends to ulceration of the parts which environ it to make for itself an exit, either into some great cavity, or upon one of the tegumentary tissues. In superficial abscesses this process is for the most part cut short by the interference of art. By this means we avoid the denudation of parts by which the opening of the abscess is preceded, and besides, the linear cicatrix which succeeds to the incision is at once less unsightly and more solid than that to which the spontaneous ulceration gives rise.

Suppurative inflammation may occur in every tissue of our bodies; but all are not equally susceptible of allowing of accumulations of the purulent fluid; to this end a certain laxity of tissue is required. Thus it is that we find pus disseminated in drops, but not in abscesses, in the thickness of serous and synovial membranes, of fibrous, cartilaginous and bony tissues, and in the substance of the heart. In those of the brain and liver, on the contrary, abscesses are frequently seen. It is doubtful whether the lungs admit of true abscess by separation of their tissues, or by their destruction. They are, moreover, very often seen in the salivary glands, in the mammæ, kidnies, prostate and testes, in lymphatic ganglia, and in the cuticular tissue itself. There is no cavity in which an abscess, or a purulent effusion may not occur; such are the serous cavities, the synovial capsules of the joints, tendinous cavities, the medullary cavities of long bones; and among those which are lined with a mucous membrane, the lachrymal sac, frontal, maxillary and sphenoidal sinuses, tympanum, and mastoidean cells. Upon mucous membranes themselves, pus finding for itself a free exit, cannot accumulate in an imposthume. But of all parts of our organization, the cellular tissue beyond all comparison, is that in which the greatest number of purulent collections is formed. Such, indeed, is their frequency, that it has been inquired whether the cellular tissue were not the only locality in which an abscess could occur, and whether every collection of matter found in the sub-

stance of viscera, were not owing to the existence of this generative tissue of organic masses. Whether or not this opinion be well founded, looking upon an abscess of the cellular tissue to be such only when it occurs in parts in which that tissue alone exists, this abscess, whether upon the limbs, or on the walls of visceral cavities, is that which the surgeon is chiefly called upon to treat, and is the only one which it is our intention now to consider.

Abscesses of the cellular tissue differ from one another, according to their different situations. The most common are the subcutaneous. These, from the projection which they create, and the inflammatory phenomena by which they are accompanied, are always easily recognizable. With deep seated abscesses in the limbs, under fasciæ and between muscles, it is not so. Of thoracic abscesses, the most common situations for external ones, are the regions of the axillæ; they are also frequent between the pectoral muscles and under the scapula; internally we encounter them in the interspaces of the mediastinum. In the abdomen, the groins are the most common situations for superficial abscesses, and for deep-seated ones, the lumbar regions.

Under the head of superficial abscess, we may include those of the sub-mucous tissue. We all know how common they are, in anginose affections about the pharynx and tonsil glands. They are met with likewise in the stomach and bladder. When these collections of matter lie between muscles and mucous membrane, they tend for the most part to open on mucous surfaces; but sometimes do so upon the skin, when their situation allows of its being so; and thus it is that we see abscesses seated in the pharynx opening occasionally upon the upper and lateral parts of the neck.

Abscesses, etiologically considered, have been divided into *idiopathic*, *symptomatic*, and *sympathetic*. A fourth class has been added by M. Roux, which he calls *constitutional*.

According to the time required by each variety of abscess in passing through its stages, they have been divided into *acute*, *hot* or *phlegmonous*, and into *chronic* or *cold*.

IDIOPATHIC ABSCESSES.

This name is applied to all collections of pus which are accidentally generated, or wholly independent of other disease.

The formation of an abscess being only one termination of inflammation, and next to resolution the most common, any cause capa-

ble of producing it, is capable of producing an abscess likewise, as, upon superficial parts, bruises, frictions, wounds, &c. From the great frequency with which such accidents as these are encountered, it will be easily conjectured that idiopathic *superficial* abscess is of most usual occurrence; the cause of that which is *deep seated* it is not always so easy to define.

SYMPTOMATIC ABSCESSES.

These depend upon some previously existing malady for their cause. They are of many kinds. First, some are produced by the presence of foreign bodies, solid or fluid. Of these foreign bodies, some act from without; such are projectiles, portions of dress, thorns, splinters, all kinds of things swallowed or passed into natural cavities, stimulant injections, and so forth. Others are again the product of animal organization, or have quitted the vessels or cavities destined to contain them. This latter class of foreign bodies is numerous in the extreme. Such are, among solid and soft bodies, shells of bone, biliary calculi, intestinal and urinary calculi, fœcal or alimentary matters effused either into the abdomen, or at the margin of the anus, &c.; and among the fluid substances, saliva, milk, bile, urine, blood itself, &c., which all give rise to abscesses of different character, a separate detail of which would be, from its length, impossible.

Secondly, others are subsequent to other inflammation, no matter what its termination may have been. Such are abscesses in the parietes of the thorax, after pleurisy, or in the abdominal parietes, after peritonitis; those in the cheeks, which result from tooth aches; in muscles, which are the seats of rheumatism; around joints whose synovial membranes are inflamed, and so on.

Thirdly, abscesses resulting from caries or necrosis are very common; their progress is invariably chronic, and of this kind are congestive abscesses.

Fourthly, we may reckon among abscesses which are symptomatic, and not sympathetic as they have wrongly been described, those which are engendered in parts by mere continuity of tissue, or in other words, by propagation of inflammation. Such are abscesses occurring in the bend of the arm, or axilla, after a puncture of the fingers; inguinal abscesses or buboes consequent upon irritation somewhere in the lower limbs, to blennorrhagia, &c., and very many others which might easily be mentioned.

SYMPATHETIC ABSCESSES.

By this name are designated abscesses created by inflammation in a distant tissue, without its being possible to explain the link by which the diseases are united, and without any necessary supervention of the secondary inflammation, by which the abscess is caused, upon the primary affection. According to this definition then, the appellation of sympathetic abscess is inapplicable where there is vascular continuity between the two phlogoses. True sympathetic abscesses are those which we sometimes meet with at the anus in pulmonary consumption, and in the liver from cerebral disturbance, if indeed such abscesses are ever produced when the liver has met with no injury.

Among sympathetic abscesses also, those called *critical* may find a place : such are the purulent collections called, very improperly, *mumps*, which are formed in the cellular tissue connecting the parotid glands to the skin, and are critical of certain diseases.

GENERAL OR CONSTITUTIONAL ABSCESSES.

This name has been given by M. Roux to abscesses which are formed under the influence of some particular predisposition, or general disease. In this respect they seem to us to be merely a particular species of symptomatic abscess. To the first variety belong those abscesses which are seen to occur in greater or less numbers, in certain individuals, without any assignable cause. Under the second may be ranked the many purulent foci which, upon the most trifling causes, and sometimes indeed for no cause whatever, make their appearance in scrofulous persons, in such numbers. Syphilitic, rheumatismal, dartrous, and other abscesses will necessarily come under the same head, if the authority of a name of respectability in science, prove to be a sufficient authority for admitting their existence.

HOT OR ACUTE ABSCESSES.

Acute abscesses are chiefly met with in parts amply supplied with cellular tissue, which is lax and intersected by numerous vessels; wherefore, *cæteris paribus*, the margin of the anus, the folds of the larger, joints, such as the ham, elbow, groin, and axilla, are oftener its seats than any other regions of the body.

The march of these abscesses, and the symptoms by which they

are characterized, differ according to the depth at which they form. Supposing it, however, to be superficial: there has existed for several days an active inflammation in the sub-cutaneous cellular tissue, the heat and redness now begin perceptibly to decline; the pain, which was originally tensive and pulsatory, has become weighty and obtuse; there is still tumefaction, but instead of being any longer diffused, it has become prominent in the centre, and has assumed a conical elevation; the skin just at this point glistens, and feels thin to the touch; besides, there is a feel of evident fluctuation. Characteristics such as these can leave no doubt of the existence of an abscess when it occurs upon the fleshy part of a limb, or on the abdominal or thoracic parietes; but we must earnestly guard against the commission of errors, when the parts are of a nature to allow of the formation of serous collections which might simulate abscesses. Such parts are the joints in hydrarthrosis; the scrotum, when, together with swelling of the testicles, there is a slight serous effusion into the tunica vaginalis. Such, again, is the back of the hand, which, in cases of inflammation, very often assumes an elastic tumidity, which might easily be taken for the fluctuation of an abscess.* Abscesses of mucous membranes, when accessible to the finger and the eye, as in the pharynx and anus, are of easy detection, and resemble subcutaneous abscesses in all their symptoms.

It is a much more difficult thing to decide upon the certain existence of abscesses which are deep-seated, or which are beneath an aponeurosis, or a fascia. Indeed they often exist for a long while before their presence is suspected. The symptoms, by which that is generally denoted, are as follows. A deep seated pain is felt in the part, which at length acquires an increase of bulk. The skin usually retains its colour; sometimes it bears a faint blush upon it; in every case it is tense and shining, and its tumefaction is diffuse. A soft pasty feel is experienced on examination with the fingers; but if

* Another affection, which might induce a like error, occurs upon the back of the wrist, as well as elsewhere. It is called Ganglion, and is an encysted, circumscribed, movable, elastic swelling, formed upon a tendon; not painful or discoloured, and filled with a fluid resembling the albumen of an egg. It is not safe to open it, and we therefore allude to it in this place. It can often be burst by a hard blow with the back of a book, a mallet, &c., and the fluid effused into the cellular tissue. Pressure by sheet lead will often disperse it; and lastly, if it is very troublesome, the cyst may be dissected out, and removed.—*Trans.*

the hands are placed flatwise on either side of the swelling, or, in case the disease is in a limb, by encircling it with both hands, and making pressure alternately from one side to the other, we sometimes succeed in making out an obscure sense of fluctuation.

As soon as certainty with regard to the presence of matter is arrived at, the sooner an exit is afforded for it, the better. Here, less than ever, are we to wait until nature shall force herself a passage outwardly; before a natural opening can form in the integuments, the pus spreads among the muscles, dissects them, as it were, one from another, destroys the cellular tissue which united them, and elevates the periosteum, laying the bone bare to a great extent.* The mischief to which all this may give rise, it is easy to foresee; and it is clearly conceivable, that the matter must burrow in those points where there is least resistance; now, no part of a limb can offer it as much as the exterior, protected as it is by two very dense tissues: the superficial fascia and the skin.

It is often the case, so difficult is it to detect the presence of a deep seated abscess, that surgeons of the greatest experience, practised in diagnosis, remain in doubt, in cases even wherein they believe that the abscess ought, from the symptoms, to exist. Of this kind, particularly, are abdominal abscesses of the lumbar regions, and those which collect within the pelvis. It is in vain that the various pathognomonic signs, such as irregular chills, existence of dull, throbbing pain, symptomatic fever, disorder and irregularity of the organs in the neighbourhood of the inflammation, are theoretically invoked to assist the judgement of the practitioner. Either these symptoms exist separately, or they are so undecided as to furnish no certain criterion; and even were they to exist in a body, how vague they are when compared with those, furnished in other parts, by feeling and the sight. It is fortunate that under such circumstances, a sure diagnosis is less important than in any other kind of abscess; for here, the surgeon can but wait; he is forbidden to resort to surgical proceedings, until the pus, burrowing for a long distance, comes and points either upon the verge of the anus, or beneath the skin. This kind of progression, which constitutes the

* Along with the pus in the middle of an abscess, we meet sometimes with large quantities of the detritus of the cellular tissue, which has been sphacelated by the inflammation. Immense flakes are often extracted, which have been happily compared by Dr. Duncan, of Edinburgh, to skeins of flax; by others, to wet and dirty tow, or to portions of wet and dirty leather.—*Trans.*

abscess from *congestion*, is rare in hot abscesses in which the inflammatory stages rapidly succeed to each other; the patients often dying of some visceral phlogosis sympathetically excited, before nature has exerted herself for their cure.

The treatment of acute abscess is certainly one of those departments of surgery, in which the most salutary influence is exercised by art. We know that an abscess which is left to itself, will very seldom get well by being absorbed, or resolved. The contained fluid becomes a foreign body, and tends, it is true, to make a way out for itself; but internal derangement is facilitated by the very slow progress of the ulcerative inflammation. It must therefore be received as a precept for general observation, that an abscess ought to be opened *early*. Several days of useless suffering are spared to the patient; the cure is rendered easier and quicker, and the cicatrix causes less disfigurement. The advantages derived from this course of conduct are so evident, that we think it needless to demonstrate the danger of the advice given by many surgeons, to let abscesses of the face and neck open of themselves, and so avoid, as they say, the unsightly scar caused by the cutting instrument; as if a cicatrix of the width of a line, and scarcely visible, made by the puncture of a bistoury or a lancet, were to be compared with the seams, and the deep depressions created by ulceration and detachment of the integuments, destruction of cellular tissue, the formation of fistulæ and sinuses, &c., all of which occurrences so frequently attend the spontaneous opening of a purulent collection. It is the same with abscesses of mucous membranes. In them, we have still greater reason to dread the effects of an accumulation of matter, because, owing to the depth at which the abscess lies, we cannot so easily control its consequences. It remains now to be settled at what period the abscess is to be opened; and what steps are to be taken before the disease has arrived at that condition.

As soon as an acute local phlegmasia is any where developed, it behooves us, by every possible means, to effect its resolution. The part is to be covered with emollient poultices; and baths, lotions, and fomentations of a like nature, are to be used. Should the inflammation run high, or threaten to extend, one or more applications of leeches should be made. Absolute rest, at least for the part diseased, should be ordered, and the patient placed upon an abstemious diet. In cases yet more serious, in which the inflam-

mation is of greater extent, for instance in a phlegmonous erysipelas involving an entire limb, the most energetic treatment is indicated and required. To the means above mentioned, one or several venæsections are to be added; by moderate doses of purgatives, irritation is to be kept up in the intestinal tube; and a strictly antiphlogistic diet must be observed. Should there, however, as very often happens, exist a sympathetic irritation of the gastro-intestinal mucous membrane, the employment of cathartics will be contra-indicated.

When, in spite of a well ordered combination of antiphlogistic measures, suppuration is likely to occur, the use of a cutting instrument becomes necessary. Generally, in subcutaneous suppurative inflammation, and in that of mucous membranes, we must, before we let out the pus, wait until fluctuation denotes its having accumulated in a circumscribed collection. Not so in *strangulated* inflammations, and in those which, owing to their being situated in parts abundantly supplied with lax and very vascular cellular tissue, spread quickly to a distance. In all such cases, our incisions must be made very early, that is to say, when we judge that suppuration is inevitable, and before the abscess forms. Of such cases, the following enumeration will suffice as illustrations. 1st, inflammations of the fingers, or whitlow, as it is called; such as occur under dense aponeuroses, as in the palm of the hand, the sole of the foot, &c. 2dly, In abscess of the armpit, groin, margin of the anus, &c., because of the abundance of lax cellular tissue in the part. 3dly, In those deep seated around the bones; in which case, the artificial opening is intended to prevent denuding of the periosteum, and the bone, consequently, from being carious or necrosed. 4thly, Those which, from their situations, may interfere with important functions, as in the pharynx, and and sometimes in the neck. 5thly, In abscesses in the vicinity of large cavities and of the joints: where the premature aperture has for its object the prevention of serous or synovial ulceration, and effusion of pus into any of their cavities; an uncommon accident, it is true, but of which examples enough are known to make it desirable to avoid encountering it. Such are the cases of the son of J. L. Petit, those mentioned by Fabricius Hildanus and Ravaton, and the more recent one recorded in the old Journal de Médecine.

As soon as an opening has been made for the evacuation of a hot abscess, the pus flows out immediately; it is a white fluid, thick,

and of about the consistence of cream; it issues generally mixed with striæ of blood, supplied by vessels which the knife has divided. The escape of the matter is aided by gentle pressure made flatwise from the circumference of the abscess towards the incision. If the abscess is superficial, as the pus flows, the integuments subside. This is less perceptible when the matter is deep seated; but if the quantity discharged is great, the size of the limb materially diminishes in bulk, the muscles and integuments, which were before firm and distended, become flaccid and soft. When all the pus has issued, most practitioners place a small tent in the wound, which, to use the happy expression of Quesnay, serves as a ladder for the ascent of the matter as fast as it re-collects, and besides, allows of a new gush of it, when it is withdrawn. Should this fail to keep the lips of the wound asunder, a slight adhesion may be observed at the first dressing, which it may be necessary to rupture; many surgeons, however, lay aside the practice. After an abscess has been evacuated, its sides, which at first were hard and congested, unload themselves every day by suppuration. Within the cyst, as in a wound, small fleshy granulations are not long in forming, which constitute the first step towards cicatrization. The details we shall not here carry on further, as we have fully mentioned cicatrization and the means of forwarding it, when treating of dressings and of wounds.

In very large purulent collections, when pus has burrowed much and far into the interstices of muscles, a single incision is often insufficient wholly to evacuate them, the fluids collecting in distant sinuses, particularly at depending points; counter-apertures will then have to be made, and sometimes several are required; upon this subject general rules cannot be laid down, and every surgeon practises what he thinks best in each particular case *

CHRONIC OR COLD ABSCESSES.

Chronic abscesses are of two sorts, idiopathic or symptomatic.

Cold symptomatic abscesses either depend upon some general affection, and upon scrofula most commonly, or upon some disease which is situated at a greater or less distance from the place where the matter collects. The latter have been called abscesses from congestion.

Chronic idiopathic abscesses most usually are developed in the

* See p. 223, and Note IV. in the Appendix.—*Trans.*

sub cutaneous ce lular tissue, or in lymphatic ganglia. They are frequently located upon the sides of the chest, neck, loins, around the pelvis, and in the lower extremities. We know but little of their causes. At times they have been seen to result from bruises, or to be owing to long continued frictions from parts of the dress. In every case they are preceded by slow inflammation and induration of neighbouring parts; are almost always indolent, and give rise to no other inconvenience, than that which results from the mechanical impediment which they offer to the functions of the nearest organs.

These abscesses may continue for a long time, for whole months indeed, without the slightest evidence of any occurrence of the ulcerative process by which the matter they contain is to be discharged. The symptoms by which the disease may be known, are a soft, fluctuating tumour, beneath the skin, in which pulsation is perceptible neither to the surgeon nor to the patient himself, which is indolent, without change in the colour of the integuments, unless, from the extreme distension owing to the great bulk of the tumour, they should have consecutively become inflamed. The pus contained in these tumours has not the characteristics which we previously assigned to it; it is usually of much thinner consistence. When the malady has proved fatal, cavities of greater or less extent are visible upon autopsic examination, which are clothed with a false membrane much resembling the mucous in appearance. Bridles often traverse these cavities and are nothing else but vessels.

The tardy progress of chronic abscesses, has caused it to be laid down as a rule to open them; although sometimes an attempt is made to produce an artificial inflammation by the local application of irritating plasters. But these remedial means, the sole object of which can be but to produce resolution, are inert, and for this reason: the organization of the abscess is such that it is circumscribed by an adventitious membrane, which forms a separate organ, and probably secretes the fluids whose reabsorption they are intended to effect. The true curative indication in cases of this kind, is to evacuate the pus, and then to inflame the false membrane sufficiently to alter the quality of the secretion, and effect a mutual adherence between the parietes of the abscess; to obtain which, the application of judicious compression, to keep the sides in apposition, is likewise essential.

Chronic abscesses are better opened with caustic than by the cutting instrument. Caustic has this advantage over the knife, that it provokes an inflammation which is favourable for the subsequent re-union. But, when the abscess is very considerable, it is preferable, perhaps, progressively to lessen its dimensions by repeated punctures. When the sides are separated at merely a moderate distance, we may make a permanent opening by means of caustic.

Chronic abscesses which are symptomatic of some general affection may arise in caco-chymic individuals, or in those weakened by unnutritious diet, or by long previous disease; but, as was before remarked, the more common abscesses of this species are those which occur in scrofulous persons. The lymphatic ganglia are the spots particularly affected with them; they simultaneously appear in large numbers, or succeed one another in various parts, as the neck, the axillæ and groins. It is rare that any individual one among them separately considered, is of much size. Their local treatment is the same as that of cold idiopathic abscesses of limited extent. When they are opened, the matter which issues is watery, turbid, lactescent, and mixed with clots, which have been compared to caseous matter. It seems unnecessary to observe that the cure of this kind of abscess ought to be promoted by the general treatment which is found to be beneficial in all scrofulous affections.

It now only remains for us to speak of symptomatic abscesses engendered by a local cause, and designated by the name of *abscess by congestion*. Their principal characteristic is the accumulation of the pus at a point more or less distant from the place at which it was originally secreted. Their most frequent cause is caries or necrosis of bone. They are met with in many regions of the body, upon the sides of the chest in caries of the scapula or ribs, on the limbs in affections of the joints, &c. But of all these abscesses, those which, by reason of their dangerous character, deserve, without dispute, the most important consideration, are those which result from caries either of the lumbar or dorsal vertebræ, or of the sacrum; to which should be added, abscesses which occur between the psoas muscles and the vertebræ, with denudation of those bones.

A soft tumour which fluctuates, and is unattended with pain or change of the colour of the skin, appears either in the loins or about

the pelvis, but usually at the upper or inner part of the thigh, at the groin, perinæum, or margin of the anus. When it is pressed upon, the tumour disappears, but returns again when the hand is removed; when the patient lies down it is less perceptible and softer than when he is on foot; and it increases and communicates a sensible impulse to the hand upon his coughing. These symptoms will generally suffice to declare the nature of the malady. Should there at the same time be a distortion, and the patient have complained for some time of pains in the back or loins, the diagnosis will be yet more certain. It has been established as a rule in the opening of this kind of abscess, owing to the accidents by which it is almost always succeeded, never to evacuate the pus until a spontaneous opening appears to threaten. Upon the article on punctures, on page 224, we have described the manner of opening cold abscesses and those from congestion. If, in spite of the precautions there laid down, we still dread the introduction of air into them, we may, after the puncture, exhaust the pus by means of the cupping pump.

The prognosis of an abscess by congestion is always fatal. No means that we can employ, in the present state of our science, are attended with any other effect than to postpone the fate of the patient. As, however, we are never perfectly sure of the true nature of the affection, and as we can succeed in prolonging the life of the sufferer, we are bound always so to act, as if we believed the case to be curable. Death generally happens both by the profuseness of the suppuration, and from the penetration of air into the cyst; and the patient sinks beneath the colliquative consequences, in a state of the most perfect emaciation. It will be found upon a *post mortem* examination of the body, that the matter has burrowed, describing a sinuous passage, from the diseased vertebræ along the psoas muscle to the seat of its collection; and when the disease has been of long duration, a false mucous membrane lines the whole extent of the fistulous canal.

In concluding what we have to say upon the subject of abscess, it would remain for us only to allude to the method of opening them. For all necessary information upon this subject we refer again to the articles of *cauterization*, *puncture* and *incisions*.

HÆMORRHAGES.

This word, in its most extended signification, applies to every flow of blood out of the vessels destined to contain it; it may occur, therefore, upon free surfaces, or in the depth of parts.

According to the part at which it occurs, hæmorrhage has received different names; but the chief differences of denomination are in bleeding from mucous membranes. When it issues from the nose, it is an epistaxis; when from the conjunctiva, opthalmorrhagia; hæmatemesis, from the stomach; hæmoptysis, from the lungs; hæmaturia, from the bladder; menorrhagia and metrorrhagia, from the uterus, &c. When situated deep in parenchymatous organs, such as the lungs, brain, &c., it is called apoplexy. Lastly, it may affect the surfaces of serous membranes, cellular tissue, &c.; but to these cases no particular names are assigned.

Many successive classifications of hæmorrhage, according to different bases, have been made. As it regards situation, those are called *internal* which are beyond the reach of surgical measures. *External* hæmorrhages are those which occur on surfaces which may be got at; particularly solutions of continuity, wounds, ulcers, fistulæ, &c., which open on the skin. Moreover, a hæmorrhage is considered to be external when it occurs in a limb, or in any place where it is accessible by an incision, without risk.

As it regards *causes*, hæmorrhage is distinguished into *spontaneous*, *symptomatic* and *traumatic*. The first comes on without a known cause; the second occurs from some alteration of tissues consequent on inflammation, gangrene, &c.; and the third results necessarily from physical injury of the vessels. Lastly, the hæmorrhages which arise exclusively from the capillary vessels, have been divided into *active* and *passive*. We encounter the former in young and plethoric persons, and they are owing to an increased

action of the local circulation. The latter occur in feeble individuals, who are scorbutic, and whose alimentation is imperfect, and are looked upon as a kind of transudation of blood through the tissues of the parts. The effects of a passive hæmorrhage being to increase the very debility by which it was induced, it is, on this account, very likely to return. With active hæmorrhages it is not so; they usually occur as critical of inflammations, and disappear with the disease of which they effected the termination.

Bleeding may spring from two kinds of vessels: arteries, or veins. In an arterial hæmorrhage the prognosis is much more unfavourable than in a venous one, not only because it is infinitely more difficult to arrest the flow, but because of the much more rapid and great prostration which follows a loss of arterial blood, than a like abstraction of venous blood from the circulation produces.

OF ARTERIAL HÆMORRHAGE.

The phenomena which attend arterial hæmorrhage vary according to the size of the vessels whence it is discharged. As this consideration should weigh very much with us in our choice of the therapeutic steps to be pursued, we shall consider this species of hæmorrhage according as it is furnished by large arteries, small arteries, or the capillary vessels. In the first and second cases, the flow is the necessary consequence of injury done to the sides of the artery, and most commonly produced by some external cause. The latter, though commonly a result of the division of the vessels, may likewise, as we have seen, spontaneously occur.

Of Lesions of Large Arteries.—Under the title of large arteries, we include all those trunks, branches and twigs of size sufficient to allow the blood to issue in jerks or spirts, synchronous with the beatings of the heart. The phenomena which accompany wounds of arteries differ according to the extent of the lesion itself, and according to the ease with which the blood can escape outwardly, or to its meeting or not, with any impediment from a want of parallelism between the tissues involved. In order to ascertain the phenomena which were the effects of arterial lesion, a series of experiments upon dogs was undertaken by M. Béclard, the principal results of which are as follows:—

First, longitudinal wounds and punctures in arteries are susceptible of cure by the efforts of nature alone, even though the

vessel shall have been denuded to an extent of several lines. Secondly, transverse wounds which involve one quarter or three-fourths of the circumference of a vessel are fatal, if the cellular sheath of the vessel have been detached; if not, they may even then be recovered from. Thirdly, transverse wounds are always fatal in the dog, when they embrace half of the circumference of the artery. Dr. Jones, in an admirable treatise upon hæmorrhage, among a great many new facts, had previously collected the greater number of those announced by M. Béclard, but had not described them with equal precision. These statements are of extreme importance; since they explain the manner in which patients who were affected with wounds of arteries, have recovered without hæmorrhage and without aneurisms. The only variety of wounds of arteries which is yet to be mentioned, is their complete section In speaking of wounds we stated that the entire transverse laceration of an artery was unattended by hæmorrhage, and a somewhat similar circumstance occurs when it is cut completely across. The middle and inner tunics or coats retract within the cellular tunic; the calibre of the vessel diminishes at each end, and from this total retraction of the vessel there occurs a separation between the divided extremities. The blood does indeed escape, but in very much smaller quantity than it does when an artery has been cut in only the half of its diameter.

In all cases in which the flow of blood could not be commanded, the patient being either alone, or the means used proving insufficient and of no effect, the following are the phenomena which have been noticed in man when a vessel has been cut across. If the wounded artery be very large, say the carotid, axillary, &c., the gush of blood is at once so profuse that death speedily follows. If the artery is of smaller size, such as the radial, tibial, &c., after a first profuse hæmorrhage, the blood ceases of itself to flow. After the lapse of a certain time, a new hæmorrhage occurs less violent than the former, then a third, and so on, the patient gradually growing weaker; a general œdema manifests itself, convulsions ensue and having sunk into the very lowest state of exhaustion, he expires.

But if the blood cannot force its way outwardly, it is infiltrated into the cellular tissue with a rapidity which is proportionate to the extent of injury in the vessel; and thus, in a short time, the limb may acquire a very considerable size. This occurrence con-

stitutes the primitive false aneurism, and calls for the most prompt assistance.

The wound of an artery by a knife or puncturing weapon, is not the only cause to which an hæmorrhage may be owing. It often results from rupture or erosion of the walls of a vessel, brought about by an inflammation which has softened its tissue, and, to use the expression of M. Dupuytren, has rendered it *secable*. We shall not enter upon an enumeration of the many causes which may produce either an acute or chronic inflammation of the coats of an artery, but shall content ourselves with mentioning a few of the principal ones; such as violent blows or bruises, sudden extension of the vessel, inflammation and gangrene of neighbouring parts, powerful pressure, either caused by an adjacent tumour, or by chirurgical means, constriction of a ligature, irritation of a foreign body, &c., &c.

The investigation of the means resorted to by nature for the arrest of the hæmorrhage yielded by arteries, has opened a field for multiplied discussions. In them, as in most theoretical speculations, we may perceive the absurdity of exclusive opinions. Each writer attributes the effect produced to some special cause of which he believes himself to be the original discoverer, whilst the result is in reality the offspring of an assemblage of causes, of a part of which only each has caught a faint glimpse. J. L. Petit, therefore, attributes the cessation of the bleeding to the formation of a clot external to the artery, and of another inner one which contracts adhesions to the circular wall of the vessel. Morand, who does not deny that these clots exist, thinks nevertheless that the principal effect is owing to the contraction of the artery, by which its diameter is lessened, and likewise to a retraction in the direction of its axis. These two effects in truth occur; but Morand was incorrect in attributing this retraction, that he speaks of, to certain longitudinal fibres, which he gratuitously presumes to exist. Pouteau denies the formation of the clot, and conceives the stoppage of the hæmorrhage to be owing to the swelling of the cellular sheath of the vessels. Bell admits that it is owing to effusion of blood into the neighbouring cellular tissue. Dr. Jones, whose name will ever be invoked when hæmorrhage is spoken of, acknowledges the truth of each partial cause, asserted by these above mentioned authors, and conceives that the cessation of the bleeding is to be looked upon as the result of their joint operation. But, according

to him, another condition of immense importance is to be conjoined with them, upon which the ultimate recovery depends; we mean a deposit of *coagulable lymph.*

This lymph is the first rudiment of cicatrization for the arterial, as it is for every other tissue. It exudes from the edges of the division when inflammation sets in, isolates each arterial coat from the other, and intervenes between the vessels and the inner and external coagula. By slow degrees the clot is absorbed, whilst the lymph thickens and effects the adhesion of the divers tissues. In eight or ten days this adhesion is sufficient to close the wound in the artery, to unite it to the neighbouring parts, and to separate it from the wound of which it made a portion, although the latter may possess a free external opening.

In mere punctures of arteries, union takes place by first intention, and, either no cicatrix is after a certain time perceptible, or else a knotty tubercle only can be felt. In cross wounds of any size, the deposit of coagulable lymph is sometimes in such quantities as completely to fill the capacity of the vessel. Wounds, generally speaking, get well by an adhesion between the opposite sides of the artery, or, in other words, by obliteration; but in some cases, however, the vessel is not obliterated, and the adhesion has taken place only between the lips of the division on the one side, and, upon the other, between the vessel and adjacent parts. When, lastly, the wound is transverse and embraces one fourth, one half, three-fourths, or the whole circumference of the vessel, complete obliteration is the only possible means of cure. This obliteration always proceeds *from the wound up to the next collateral branch* given off by the trunk. We shall not enter in full into the method by which circulation is re-established, when a large artery experiences an interruption in the continuity of its canal. We know, that in this case, the collateral branches dilate in greater or less numbers, until they have supplied the place of the principal artery. The smallest twigs are susceptible, under these circumstances, of considerable dilatation; so much so, that in a patient who had been many years before operated on for popliteal aneurism, M. Boyer found a branch as large as the radial artery embedded in the thickness of the sciatic nerve.*

* By the anastomosis of arteries is meant the frequent junctions and intercommunications between them, before they arrive at their final termination.

Of the Lesions of Small Arteries.—Under this head we include all arterial branches so small as that the blood can flow from them in almost a continued stream, when they have been completely divided. These vessels are of about the size of a large wire, and seldom yield blood enough to carry off the patient. In a young and robust person, the hæmorrhage ceases of itself, as soon as the inflammatory swelling of the divided parts sets in; but if a great many of these vessels are opened, the patient may sink exhausted by a succession of trifling bleedings, because, in proportion as the blood becomes serous from repeated subtraction, the hæmorrhage recurs with greater facility. From these considerations, it becomes the duty of the surgeon to put in use, as soon as possible, every proper measure for checking the sanguineous discharge.

Of Lesions of Capillary Vessels.—Traumatic hæmorrhage of capillary twigs seldom proceeds far enough to give rise to anxiety. It is frequent during the first few hours, after capital operations, when the first period of spasm passes over; and it is then salutary,

These always become more numerous in proportion as the vessels get further from the heart; the object of which arrangement is to facilitate the course of circulation, which encounters more obstacles as it proceeds from its centre. In the brain, eye, &c., the regularity of whose functions is very much influenced by that of the heart, anastomoses are very frequent. Whatever be the kind of intercommunication, the vessels themselves which anastomose send off branches which unite anew; and by these inosculations, grafted as it were, upon each other, it is, that circulation is kept up when a large trunk is tied or obliterated. In that event, the larger branches undergo a slow, but remarkable dilatation, and become very tortuous; secondarily, the minor twigs which they furnish, increase in size; and thus, after some time, channels are formed sufficiently capacious to transmit the blood which had previously passed through the principal artery. Gradually, the largest of the anastomotic branches enlarge and become permanent trunks; the small ones collapse to nearly their previous size. *The Am. J. Med. Sc.* for May, 1831, contains two plates of the dissection of the injected head of a person, in whom the carotid artery of one side, was tied by Dr. Mott, three months and nineteen days previously; and a paper, in which that gentleman has recorded with minuteness, the condition of the vessels of the head and neck. From these, an excellent idea of the increase of size in the large arteries, left carotid and subclavian, of the tortuosity and enlargement of the inosculating branches, and of the freedom of anastomosis may be derived. A similar dissection of a lower extremity in which the femoral artery had been tied, was made by Sir A. Cooper; and an account of it is published in the *Med. Chir. Trans.*, *Vol. II.*, to which plates are annexed.—*Trans.*

as by producing disengorgement, it tends to lessen the intensity of the subsequent inflammation.

But there is a kind of capillary hæmorrhage in which the blood may flow in *a sheet*, and so abundantly as to render it difficult to arrest it; this is in cases of certain fungoid tumours and aneurisms by anastomoses of capillary arteries, when such diseases have been opened or wounded. When these discharges tend to recur in spite of the employment of suitable means to prevent them, the extirpation of the malady, whenever it is practicable, then becomes the only sure treatment.

Spontaneous hæmorrhages, whether active or passive, are the most common of those which ensue from the capillary vessels, and such sometimes are the quantity and frequency of their recurrence, that the patient dies exsanguineous. Two such cases we remember to have seen. Of the means of arresting such hæmorrhages, we shall speak further on.

OF THE TREATMENT OF ARTERIAL HÆMORRHAGE.

Before we begin to stop the bleeding, we are to wash and cleanse the surfaces with great care, with a piece of fine sponge, in order to ascertain whence the blood springs.

Very numerous means have been employed for the purpose of suspending the course of an hæmorrhage. Taking them in the order of their utility, they are, absorbents, refrigerants, astringents, styptics, caustics, the actual cautery, pressure and the ligature.

Absorbents.—This is the name given to soft, spongy substances, capable of being saturated with blood, or with inert powders which may form with that fluid a kind of solid *magma*. Spider's web, spunk or agaric, soft dry sponge, scraped lint, are of the first kind; resin in powder, and colophane in particular, belong to the second.

The spider's web, spunk, &c., may be employed alone; whilst the resinous powders require some intermediate body, to the surfaces of which they can adhere for the purpose of being applied; absorbents of a membranous character, such as lint and spunk, generally perform this office. Absorbents are only proper in arresting capillary hæmorrhage, when the blood is flowing in a sheet. Therefore they are placed upon leech bites, and laid on after the extirpation of fungosities; besides which, slight pressure is sometimes required. Absorbent substances are not without their inconveniences; when dry, they form hard crusts which wound the parts

beneath ; and they adhere so firmly as to make it difficult to detach them. Steeping them in water for some time beforehand, facilitates their removal.

Refrigerants.—We are already aware that under this name are comprehended affusions, lotions of cold water, applications of compresses steeped in that fluid, or those of bladders half filled with pounded ice, which are alternately laid on and taken off, lest the parts might be frozen. We shall not enlarge upon their mode of action, which is evidently this: that by a prolonged subtraction of heat, they tend to slacken the force of circulation in the part to which they are applied. As, for external hæmorrhage, our art is in possession of much more efficient means, refrigerants are but little used except in inward bleedings, which by their locations are inaccessible to surgical measures. We therefore apply cold water by compresses upon the chest, in hæmoptysis ; upon the epigastrium, in hæmatemesis ; over the hypogastrium, in hæmaturia ; to the inner and upper parts of the thighs, in metrorrhagia, or uterine hæmorrhage Injections of cold water into the vagina, act in the same way in the latter case. Bladders filled with ice are laid upon aneurisms, particularly when they are so near the trunk as that pressure cannot be exercised over them. Lastly, many cases, and among others a very curious one contained in an essay by M. Alphonse Sanson, go to prove that general cold, and by analogy, the use of ice, may be useful in wounds of the heart, and by extension, in lesions and aneurisms of the aorta.

But whatever benefits refrigerants may be capable of affording, the serious consequences to which they are liable to give rise must not be lost sight of. If there exists an acute phlegmasia, such as peritonitis, pleuritis or pneumonitis, which the least cold will increase, their use must not be attempted.

Styptics and Astringents.—These agents operate, as we know, by producing constriction and puckering up of tissues ; and it is easy to conceive how the exercise of this action upon small capillary vessels, may be attended with the cessation of an hæmorrhage. Astringents and styptics are used in powder, or in solution ; the latter form is preferred, as it possesses the advantage of acting on all the points of an uneven surface, by means of lotion and injection. They must be employed with some caution, as their hasty astringent effect may result in high inflammation ; and this observation

particularly applies to solutions of the sulphates of copper and of iron.

Styptics and astringents do well only in cases analogous to those in which refrigerants were recommended. Burnt alum and the sulphate of copper are frequently employed for arresting, by the production of feeble cauterization, an hæmorrhage furnished by small vessels.

Of Caustics and the Actual Cautery.—Caustic, from the circumstance of its being attended with the formation of an eschar, must necessarily offer an advantage as a means of producing temporary obliteration of the orifice of a vessel whence blood is pouring. Owing, however, to the difficulty and danger of its use, the actual cautery is preferred to it, as the action is more prompt and certain, and always under control. The use of caustics is now confined to those cases in which the blood springs from a deep place; such particularly, are the bites of leeches on the cervix uteri, when they bleed too profusely. Nitrate of silver is, in such a case, the caustic which should be preferred. For its more certain introduction a *speculum uteri* is employed. It is needless to dilate upon the method of procedure in analogous cases.*

* Of the speculum there are several varieties. It is an instrument which mechanically dilates the parts into which it is introduced; and, by the polish of its surface, serves to reflect light, either natural or artificial, upon diseases in, or hæmorrhage from them. To the ingenuity of surgeons we are indebted for a speculum *uteri*, *ani*, *oris*, *auris*, *gutturis*, *oculi*, and *vesicæ*.

The speculum uteri is sometimes merely a tin, pewter or steel tube, slightly conical, and of a length and width proportionate to that of the part. The small or uterine end is often open perpendicularly to its thickness, and has a projecting rim; the other end is wide, and from it comes off, at right angles, a handle, which renders it of much easier application. Such is M. Récamier's speculum, to which the handle was added by Baron Dupuytren.

Another and very complete instrument is that of Mdme. Boivin, a distinguished midwife and *physician* of Paris. The cylinder of which it consists is divided into halves, and it is furnished with a handle with two rings, like those of scissors. By separating these, after the speculum has been introduced into the vagina, the two halves separate also, and the canal is dilated in this way. The only objection to this instrument is, that when the halves come together again, they sometimes pinch a fold of the mucous lining of the vagina between them.

When we are to use a speculum, the patient is laid in the posture for lithotomy. The surgeon places himself in front of the vulva; warms and greases the instrument; and passes it, closed, with gentleness, into the vagina,

Cauterization by the red hot iron is one of our most efficient means for suspending hæmorrhage. It is insufficient only in that which proceeds from large vessels. In every case in which ligature or pressure cannot be employed, it is proper; such as bleeding from the raninal arteries, from vessels at a great depth, or in bony canals, as are particularly many twigs from the internal maxillary artery in operations which are performed on the face. Cauterization, again, is the only means which can be applied after the removal of fungous, cancerous and erectile tissues, and in short, whenever blood is flowing in a sheet from very extensive surfaces. Besides the mere suppression of the sanguineous discharge, the use of fire in these cases permits of our destroying portions of diseased tissues which may have escaped the knife. Cautery, lastly, may be resorted to for obtaining the obliteration of the mouth of a phlogosed artery, the inflammation of whose coats would render it impossible to tie it. When an artery is of considerable size, we should, as a matter of precaution, reapply the iron two or three times. For the manner of performing actual cauterization, we refer to our remarks on that subject under the head of artificial ulcerations, on page 151.

Compression.—Three kinds of compression were described in the article upon surgical dressings, viz., the direct, the lateral, and the circular, and the manner of effecting them was also detailed. The method of exercising pressure for the relief of hæmorrhage does not differ essentially from that which we have there mentioned.

The objections to direct compression, when made use of for crowding back the mouths of vessels on the surface of a large wound, particularly of a stump, were there detailed. Still, there are circumstances under which this means is efficacious; of which, tam-

making pressure principally upon the posterior commissure of the pudendum. If it be Récamier's speculum, we lean it either to the one side or the other, until the disease is fairly at its orifice. If, on the contrary, that of Madame Boivin be employed, we open the handles, dilate the vagina, and the seat of hæmorrhage, &c., is exposed. By these means, either a cautery iron or caustic may be applied; or a bleeding vessel secured by the tenaculum, a ligature, and the cross piece for carrying the knot upon an artery at a considerable depth. The speculum ani is merely a similar tube, tapering from its outer to its inner end, and fitted with a handle. It is often of use in enabling the surgeon to secure arteries which bleed in the rectum: for instance, after the excision of internal hæmorrhoids, of which a case is mentioned by Sir A. Cooper, wherein the hæmorrhage was the cause of death.—*Trans.*

poning the fossæ nasaliæ, after the removal of polypi; of the rectum, after the excision of internal hæmorrhoids; of the vagina, in certain bleedings from its parietes, &c., may serve as examples.

Tamponing of the nasal fossæ is different from the rest. When we reflect upon the mode of its action, we perceive that it is not by the exercise of direct pressure that it restrains hæmorrhage; but in truth, by obstruction of the egresses from a cavity, wherein the blood being confined, coagulates and thus prevents a fresh emission of the fluid.

For the purpose of performing this plugging or tamponing, we pass into the nostril whence the blood flows, either the instrument called the sound of Bellocq, a gum elastic catheter, or a piece of whalebone. If Bellocq's instrument is preferred, the probe end or knob is brought out into the mouth; if the other instruments, we pass in the fingers and seize their ends beyond the velum palati, and so bring them out into the mouth. In either case, we attach to the oral end of the catheter a waxed thread, strong and doubled, which, at its other extremity, is firmly tied to a large pledget of lint. We then pull on that end of the catheter which projects outwardly from the nostril; the pledget of lint is drawn up until it presses firmly against the posterior orifice of the nasal fossa; next we separate the two strings which hang out from the nose, and at the angle of their separation we place another pledget of lint, just like that which is within the mouth, and tie the strings firmly upon it, so as to clog the anterior nasal orifice, as had been previously done to the posterior. If the blood should come from both nostrils, which is very uncommon, then both fossæ must be plugged in the same way. In case the patient should find any difficulty in breathing through the mouth, owing to the size of the plugs, by merely passing the fingers into the pharynx, and pushing up the tampons so as to flatten them against the posterior nasal orifice, an easy passage will be given to the air through the isthmus of the fauces.

The vagina, the rectum, and the wound made in the perinæum in the lateralized operation for stone, are tamponed with a silver canula, which has at the end that is to be passed in, a circular rim or collar; around this collar is fastened the circumference of a sort of linen shirt. Thus clothed, the canula is placed in situ, and the bottom of the shirt forms a cul-de-sac, into which, with dressing forceps, lint is crowded, either by itself, or impregnated with absorbent powders; when lint enough has been passed in, it is easy to conceive that

by pulling upon the ends of the canula and of the bag of linen which project outwardly, whilst with the fingers we make pressure on the lint, the mass is obliged to spread itself transversely, and to assume the shape of a mushroom. The direct compression by which this is followed, arrests the hæmorrhage. This instrument is very convenient, and the canula, which is either stopped or not, allows at pleasure of the passage of the matters which may come from above. However, it does not always answer the end for which it was designed; because of the extreme ease with which the soft parts are dilatable, and their yielding to the pressure. The blood, ere long, glides betwixt the tampon and the diseased part; and usually collects above the canula, and escapes in coagula when the latter is uncorked. When this occurs, and ligature is impossible, the actual cautery is our only remaining resource.

Lateral compression is oftenest made use of in very large and copious hæmorrhage. We know that for it a fulcrum is needed; which, upon a limb, is generally the bone which gives name to the artery. When an hæmorrhage is given out by an artery of considerable size, it is proper to compress it either at the very spot, or directly above it; and in case the anatomical arrangement of the parts were to oppose effectual compression in that way, for instance, in wounds of the fibular or tibial arteries at their upper parts, the principal trunk in the limb must be compressed. To this end, J. L. Petit's tourniquet, or M. Dupuytren's compressor is employed. If neither of these instruments are at hand, nor to be obtained, we can supply their places with a graduated compress, the smallest side of which is to be placed upon the track of, and parallel to the axis of the artery. Over this compress, we place another about two inches square and some lines in thickness; the latter should then be covered with a plate of copper, tin, wood, or even pasteboard; then the limb should be circularly enveloped with a bandage, strong ribbon, or handkerchief, tied loosely on the surface opposite to the artery; at that spot a new piece of wood or pasteboard should be put, and a stick passed under the band, by which it can be twisted and tightened, would perform the office of a tourniquet. An apparatus of this kind, called the stick or field tourniquet, is every where easily arranged; it is very solid, and in cases of accident, &c., arrests the hæmorrhage with sufficient efficacy to enable us to await the arrival of a better instrument, or to perform ligature of the vessel.

The lateral pressure exercised by tourniquets and compressors,

particularly when they are placed upon the seat of the wound in the artery, has been occasionally sufficient for effecting the obliteration of the vessel. Several cures, obtained in this way, might be cited; particularly of the brachial artery after it had been wounded in venæsection. However, the inconveniences with which it is attended are numerous. If it is feeble, the blood infiltrates into the tissues. If it is violent, it gives extreme pain, and produces congestion in the veins and absorbents below it. Besides, after a while, the apparatus either becomes loosened, or the compressed tissues diminish in bulk; in either case, the blood passes into the adjacent cellular tissue. It is not prudent, therefore, to rely too much upon compression as a means of cure.*

* Important as is the instrument called the *Tourniquet*, no description of it has been given in the text; a deficiency which we shall endeavour briefly to supply. Until the invention of the first instrument of this kind, for which we are indebted to J. L. Petit, in 1718, surgery was a very defective art. No large operation could be undertaken with safety, and the means of arresting hæmorrhage were imperfect, few, unavailing or cruel. The tourniquet has since that period undergone many changes; that which is now most used may be described thus. It consists of a brass screw which is received into a brass plate, bridge, or frame. Up and down the vertical screw, a second frame, by means of its female screw, can be raised or depressed. To each side of the *upper* frame is attached a roller; to the *lower* frame, there are *two* on either side. There is besides, a strap two feet long, made of webbing, with a buckle at one end. Upon the strap, by means of a flat leather loop, slips a wooden or cork pad, flat on the surface nearest the strap, and convex on the other. This pad is intended to lie directly above and over the artery. The pad should not be thicker than the thumb, and an inch and a half in length.

It is very necessary to be familiar with the manner of arranging a tourniquet for use; for in the event of the breaking of a strap, which often happens, it may be instantly requisite to adapt another without delay. For the same reason, some extra straps should always be at hand. The method of doing it is as follows. The frames being placed parallel to each other, but at a considerable distance apart, the loose end of the strap is first passed in between the rollers of the lower one, on either side. Thence it ascends outside of the roller of the upper frame; in between it and the frame; down between the inner edge of the inner roller of the lower frame and the frame itself; under the instrument; up between the inner edge of the inner roller and the frame, on the other side; between the upper roller and the frame; outside of the upper roller; and down between the two lower rollers, where the strap hangs loose.

Having, by our anatomical knowledge and the touch, determined the situation and direction of the artery in the limb (to which parts only are tourniquets applied), we slip the pad along the strap until it comes directly upon

Lateral compression is very certain in its effects, when applied over the vessels which run upon the surface of the cranium. When we were speaking of arteriotomy, on page 172, we detailed the manner of its application. Upon the surface of the trunk of the body, it could only be useful in wounds of the intercostal arteries. The great varieties of means contrived to meet that particular exigency, is well known. In our opinion, the best is that of Desault; which is a tamponing similar to that which we have already described. It consists in introducing into the intercostal space, the bottom of a piece of linen, whose ends hang out; this linen is filled with lint, and to make the pressure, the ends are pulled upon, but chiefly that one which is nearest the artery, in order that the cushion formed by the lint may be there most firmly applied. It is very important to keep the ends of the linen securely outside, lest it, or some filaments of the lint, should fall into the cavity of the pleura. The best way to avoid this accident is to pass a doubled thread all along the loose edge, so as to make it look like a bag. When the lint is introduced, we make a few turns of the thread around the bag, tie it, and fasten its loose extremity to the bandage which covers the wound.

Ligature.—This is the most certain means which we can employ to oppose the continuance of hæmorrhage, and compression and cauterization ought only to be practised in those cases in which it is impracticable.

it; then place the instrument upon the fore part of the member, having first applied a small compress beneath it, and carry the strap round and buckle it with sufficient tightness. An assistant then places his finger over the vessel in some part of its course below, or upon a large branch, and the surgeon turns the screw of the tourniquet, by which the frames are made to separate from each other, until pulsation ceases.

For stopping hæmorrhage, this, although an invaluable, can only be a temporary expedient, until the surgeon can adopt means of a more permanent nature. The known effects of circumscribed compression (p. 41.), would speedily compel us to remove it. A tourniquet does not require the aid of an assistant to keep it tense; it completely commands the flow of blood; and is easily tightened or loosened. When there is reason to fear a sudden renewal of bleeding, it may be left slackly around the limb. Should the surgeon however, have applied it badly, and hæmorrhage ensue, he should not continue twisting and turning it; but quit it at once, and compress the artery by his fingers, a key, a pad, or other means, against the bone, until the tourniquet can be properly readjusted. Of the use of this instrument in capital operations, it is not for us to speak.—*Trans.*

The operations undertaken for placing ligatures around arteries, are considered to be the most difficult in the whole range of capital surgery; and of course, are completely without our bounds. A few words, however, we shall say, upon the effects of ligatures and the means used for their application.

Ligature is an operation in which an artery is surrounded by a string, which is then tied upon it. The necessary consequence is the interruption of the circulation through the tied vessel. But it has already been shown, that for this effect to be permanent, the vessel must be obliterated. The obliteration of an artery is effected in the following way: According to Dr. Jones, a ligature is no sooner drawn tightly around an artery, than the inner and middle coats are divided; the outer or cellular tunic alone remains entire. The blood within the vessel comes down to the ligature, and not being able to pass beyond it, there coagulates; the coagulum filling the calibre of the vessel up to the next large branch. The effusion of coagulable lymph before spoken of, now very soon occurs; and inflammation sets in at the edges of the division in the coats. The cellular tunic itself inflames above and below the ligature, to cut off the portion strictured by the string. With the consecutive phenomena, that is to say, the re-absorption of the coagulum, the thickening of the lymph, and the adhesion of the contiguous surfaces, we are already familiar. As long as the cellular tunic resists in the neighbourhood of the ligature, hæmorrhage cannot be produced; but it occurs if the obliteration be not entirely effected at the moment at which the artery is cut across, that is to say, when the living and inflamed portion separates from that which has been strangulated. This is called consecutive or *secondary* hæmorrhage. Too acute an inflammation in the coats of the artery tends to bring on a recurrence of the hæmorrhage, by opposing adhesion on the one hand, and on the other, by rendering it easy for the fresh ligatures which are put on, to cut through the softened outer coat. In this respect, therefore, we perceive that inflammation in arteries, produces the same effects as in the other tissues. In cases of secondary hæmorrhage resulting from inflammation, we may abandon all ligatures to the free orifice of the vessel. If it is a small one, we may cauterize it; if it is large, we must, after making a suitable incision, tie it above somewhere in its course, where the *coats of the vessel are healthy*. Lastly, when a ligature requires to be applied for an arterial wound, it is prudent to tie the *lower* as well as the upper

end, so as to guard against the hæmorrhage which may occur from anastomosis.

Ligature, according to the way in which it encircles the vessel, is called *mediate* and *immediate*. The mediate ligature is one which has interposed between it and the vessel some foreign body, usually a cylinder of linen rag. This bad practice is now, in spite of the sanction of Scarpa, completely abandoned. In immediate ligature, the artery is surrounded directly by the string alone ; and this is the plan of daily adoption every where, and by every body.

Ligatures, as it regards the time that they remain in place, are distinguished as *temporary* and *permanent*. They have been called temporary, because the string is cut off and removed as soon as it is thought that the obliteration is complete. This is a dangerous procedure; if the adhesion be not yet sufficiently solid, either we may have secondary hæmorrhage, or a relapse of the disease for which the ligature was applied. A permanent ligature is left to itself, and falls off when the artery is divided by the inflammation it creates. This is the plan now universally followed.*

* It is a matter of surprise to the translators, that an instrument of such paramount utility in the securing of arteries as the *Tenaculum*, is not mentioned by M. Bourgery, whose remarks upon that subject are somewhat deficient. It consists of a moderately curved and sharp pointed sickle-shaped hook, firmly fastened into a handle. For its adaptation to the pocket case, in which it ought always to find a place, the handle is sometimes a movable one. When this instrument is to be used, the surgeon ought to be provided with an assistant, who stands by with a suitable ligature to secure the vessel when it is seized. The surgeon, holding a sponge in his left hand, wipes the bleeding surface, and when he detects either the spirt of blood, or an oozing, he passes the point of the tenaculum with his right hand, through and through the artery and closely adjacent parts, including as few of these, however, as possible ; the vessel thus hooked, is drawn out ; the tenaculum is held so as to give the most room, and the assistant casts a noose with the ligature over it, beyond its point. The convexity of the instrument facilitates the slipping of the thread to its proper place. The assistant then tightens the noose ; makes a loose knot, which he pushes with his fore-fingers down upon the artery, then pulls very gently upon the ends of the ligature with his other fingers, to tighten the knot ; which traction he causes to be made *perpendicularly* to the track of the vessel, by the assistance of his two fore-fingers carried down to it, over the fleshy parts of which the ends of the thread are reflected. The surgeon then draws out the tenaculum, and a second knot is made upon the first. The most important arteries are first to be secured, and subsequently those which ooze ; and a little time should be allowed to elapse before

Very many substances are used for performing the ligature of vessels. In France, a hemp string well waxed, and of a size propor-

the dressing is proceeded to, to guard against secondary hæmorrhage; which would require the wound to be re-opened, and dressed anew; for an artery which at first did not bleed, or one which only *slobbered*, as the French say, will, when reaction comes on, and its tunics recover from their state of spasm, and that of the neighbouring parts no longer compresses it, pour forth blood very freely.

A tenaculum may be employed by the surgeon unaided; it has an advantage over the forceps, in that it can be used even in the most difficult cases; it does not so easily let go its hold; nor do we, in using it, run any risk of including the vessel and the instrument together in the knot, which would oblige us to re-apply the ligature. (See p. 28.)

The dissecting forceps, described on page 3, is used for tying the vessels in a wound which are large and distinct. With it, the vessel is taken hold of on the outer side of its orifice, and tied as above detailed. The artery forceps, whose blades differ in being very narrow for an inch from the point, and in being furnished with a button which slides up and down in a groove between them, and by which they may be kept closed, is a better instrument. It enables the surgeon, when alone, to secure the vessel firmly between the teeth at the point, and either to let it hang down, or to give it to be held by a bystander, whilst he himself proceeds to tie the vessel. To dispense with the necessity which exists of using the left hand to push down the button, a new forceps has been constructed by Mr. P. Rose; to close or open which, *one hand* alone is necessary. It is of the usual shape, but to the inner surface of one blade, a steel spring which curves upward like a fish hook, is riveted. This, when the blades are pressed together, enters, and is caught by an opening in that opposite to the one on which it is fastened; and thus the instrument is permanently closed. A slight motion of the fingers serves to reopen it, by disengaging the spring. The facility of managing it makes it preferable, we think, to that which has been hitherto in use.

When lastly, both forceps and the tenaculum have been unsuccessfully made use of for seizing a small vessel, we may advantageously employ a suture needle, armed with a ligature. We pass its point through the soft parts whence the blood issues, include the vessel in the loop of the thread, and tie it with a double knot as in the preceding cases.

A means of arresting hæmorrhage, the discovery of which is disputed by MM. Amussat and Velpeau, consists in *torsion* of the arteries, or in twisting them upon themselves, and so, by effecting a rupture of the inner and middle coats, and an elongation of the outer and cellular one, to intercept the flow of blood through them. To do this a forceps is necessary; with it the artery is drawn out for a few lines from the wound; with another forceps the adjacent tissues are put aside and the vessel is fastened on a level with the muscles, to limit the extent of torsion, and is then twisted several times on its axis, until it resembles in some measure, a screw. It is as easy to twist

tionate to that of the vessel, is used. Formerly, for large arteries, two or three strings put back to back, so as to form a kind of ribbon, were employed, for fear that one might not offer sufficient resistance. This is now abandoned, as we have learned from experience that a single string is sufficient, and that besides, it is inconvenient to leave too large a mass of foreign bodies in the wound. For this latter reason, Mr. Lawrence, in England, employed a string of dentist's silk instead of the hemp one. He also conceived the idea of closing up the wound over the ligature, without taking any steps for its extraction. This method is not attended with all the advantage for which its able author hoped. The silk, indeed, is strong enough for ligatures; but when left in the wound, and it closed over them, abscesses form, and they escape with the pus. Lastly, as a means of avoiding having to await the coming away of the ligature, and of being able at once to heal up the wound by first intention, it has been a desideratum to employ something as a ligature, which would soften among the tissues and be absorbed. With this view, catgut and tendon were first employed, but these early attempts were unsuccessful. Dr. Physick, of Philadelphia, then conceived the idea of using buck or doe skin; and from an essay on the subject recently published by Dr. Jameson, of Baltimore, it appears that this substance, when used as a ligature, will indeed be absorbed without causing an abscess, or even cutting the artery across. This discovery, if well founded, by allowing us to unite wounds directly after the operation for ligature, would be one of the most interesting and valuable made in recent surgery. Let us hope that ere long such a mass of facts may be accumulated by experience on the living subject, as will establish the certainty of this useful innovation.*

large arteries as small ones; but the latter require fewer twists than the former. This has now been done so often, as fairly to be entitled to the credit of being a hæmostatic means, and which one day may supersede the ligature altogether. It needs no assistant; admits of immediate reunion; and secures us against secondary hæmorrhage. (*J. Cloquet. Dict. de Méd.*)—*Trans.*

* There can be but little doubt that all that is required of a ligature, may be obtained by using saddler's white sewing silk, slightly waxed. The white silk is stronger than that which is dyed. It is round; small enough for small vessels, and strong enough to secure the largest artery in the body. When the arteries which are tied are small and superficial, one end may be allowed to hang out of the wound, and the other may be cut off close to the knot. In five or six days they will be cast off by ulceration; after this time, the gen-

VENOUS HÆMORRHAGE.

It is rare for an hæmorrhage from the veins to be so imminent as to demand special assistance. Veins, generally, only bleed when the vessels are of considerable size.

We know that a vein is wounded, when, independently of the situation and direction of the wound, there issues a reddish brown fluid, very different from the vermillion redness of arterial blood; moreover, this blood, instead of flowing by jerks, or in a steady stream, as it does from an artery, oozes slowly in a sheet. If pressure *above* the wound is made, that is to say, between the latter and the heart, the bleeding is redoubled in profuseness; on the contrary, it is suspended when pressure is made *below*. The latter phenomenon is exactly the reverse of what occurs when an artery is wounded.

The danger is always in proportion to the depth at which the wounded vein lies, and its value to the circulation. If the hæmorrhage flows from a superficial vein, all that is generally needed, is slight lateral pressure, and the blood resumes its natural course: an effect seen daily after venæsection. But if the wounded vein lies deep, compression may be insufficient; and we are then advised to tie the vessel above and below the wound. This should not however be resorted to, unless all other means have failed, for we well know that the ligature of a vein is often followed by extensive phlebitis.

Lastly, when a principal trunk, such as the femoral or axillary, is wounded, the danger is extreme. The surgeon is here upon the equally vexatious horns of a dilemma. If pressure be not sufficient, the blood is infiltrated into the limb; if it be excessive, the circulation is impeded, and the limb becomes congested below. This is an exceedingly embarrassing situation, and it must be confessed, that in her present state, surgery has no means to oppose to the occurrence. Ligature, which would be proper on a large venous branch, we dare not apply upon the large trunk which carries all the blood of a whole limb. Moderate pressure only can be exerted,

tlest traction upon them may be made at each dressing of the wound, to accelerate their separation. Generally, however, they are detached of themselves, are perceived to have risen towards the surface of the wound, and may be drawn out with the fingers or forceps.—*Trans.*

and every possible means employed to slacken the circulation; if the patient is young and full habited, venæsections may be practised, and we should endeavour, by the position of the part, to assist the flow of blood through the anastomosing channels.

Hæmorrhage is seldom severe which flows from veins during an operation, or some time afterwards. We know that the advice given by M. Dupuytren, to direct the patient to draw several long inspirations, without exerting himself in expiration, is generally sufficient to arrest it.*

* See Note XXII. in the Appendix.—*Trans.*

THE END.

APPENDIX.

BY THE TRANSLATORS.

SPLINTS.

Note I, p. 22.

A new species of splint was recommended to the profession, by David S. C. H. Smith, M. D., of Sutton, Mass., in 1831, which is well deserving of attention. It is composed of *Felt*, "a material of much firmness and strength, possessing the important property of moulding in a few minutes into any required form, by the mere application of heat, so as to conform to the slightest elevations and depressions of a limb, as perfectly as would a cast of gypsum or of clay."—*Dr. Smith's Pamphlet.* It is infinitely preferable to pasteboard, and affords an excellent support to the part. The Doctor has a patent for a manufactured set of fracture apparatus, made of this material. They are for sale in this city, by Messrs. W. W. Bradhurst and J. H. Currie, Druggists.

CAUTERIZATION.

Note II, p. 133.

A better way of using the kali purum, in the opening of abscesses, buboes and issues, is the following:—Rub up a little of the potassa with soap into a paste, and add a few grains of pulv. opii; spread it upon the part in a hole in a piece of leather or adhesive plaster, previously applied; over this lay another; in six hours let it be removed, and a poultice be put on. An excellent caustic for the destruction of fungous growths, and even of urethral stricture, is a sat. solut. of corros. sub. and the mur. ammoniæ. It should be applied with a camel's hair pencil to the diseased part, if a fungus; or, in the latter case, it should be allowed to crystallize upon a bougie, and be passed down through an outer instrument to the seat of stricture.

TRAUMATIC NEURALGIA.

Note III, p. 163.

Terrible neuralgia sometimes occurs subsequently to venæsection, owing to the inclusion in the cicatrix of some fibrillæ of the cutaneous nerve, or the imperfect section of them, spoken of in the text. In the former case, the cicatrix should be excised.

THE PUNCTURING OF ABSCESSES.

Note IV, p. 223.

Although repeated punctures may be necessary in the cold or chronic abscess, in which case reunion is carefully to be attempted between the edges of the wound, it is not often that an acute abscess requires more than one. Moreover, for it to heal kindly by a single incision, no local cause should exist capable of keeping up the suppurative inflammation. The incision into an *acute* abscess, though sometimes very simple, often requires skill. A thumb or abscess lancet does well in unextensive cases, or in cases in which a slight incision only is required. But, where free or deep incisions are to be made, a sharp pointed bistoury, with a straight or convex blade, is better. An abscess which is deep, and the fluctuation of which is dull, should be opened by cautiously cutting through the layers of soft parts which

compose its wall; and those which lie over large cavities, or are near to important parts, whose relative situations may be altered by the progress of the disease, should be treated in the same manner. A distinguished French surgeon once transfixed the femoral artery, in opening an immense abscess in the thigh. The pus had lifted up the vessel and made it almost subcutaneous.

Incision may either be made from without inwards, or from within outwards; the edge of the knife looking either up or down. The more superficial the abscess is, the less extent will be required for the incision, which is generally made in a direction parallel to the axis of the body. In a majority of abscesses, one incision will suffice; but more may be required. When the cyst is emptied, a few filaments of lint may be placed between the lips of the wound, to keep them open in the least possible width. When we have opened a large abscess on a limb, a roller bandage applied around it, by making uniform pressure, is very useful; but its turns must leave the aperture free, over which, if necessary, a poultice may be put on. The lint should be left off at the second dressing, and merely cerate applied. If, however, in a mammary abscess, the wound seems likely to heal, it should be probed, and lint, or a tent of linen rolled between the fingers, should be kept in it as long as is necessary; else the original opening may require to be re-incised.

Caustic, though sometimes employed in effecting the opening of a chronic abscess, is seldom resorted to for that of an acute one.

If an abscess points, it should be opened at that spot; but, if not, it is better to perform the incision in the most depending part of the tumour.—*Sir A. Cooper. S. Cooper. Roux and Bérard, Dict. de Méd.*

PUNCTURING OF DROPSY.

Note V, p. 227.

Paracentesis is the general name given to tapping, either of the head, chest, belly, scrotum, or bladder; all of which parts may at times require the operation to be practised upon them. The first is done in cases of chronic hydrocephalus in children; the second in empyema, hydrothorax and emphysema; the next two are of common occurrence, and are described in the text. Paracentesis vesicæ, for retention of urine, is very rare. Roux, in Paris, and many other surgeons elsewhere of equal celebrity, have never encountered it; but it may be called for.

The diseases with which *Ascites* may be confounded, are tympanites, pregnancy, distended bladder, hydrops uteri, encysted dropsy of the peritoneum, and tumours in the abdomen of a fluctuating feel.

Tympanites affords a much more distinct sound upon percussion, and differs so much in its progress from dropsy, as scarcely to be mistaken for it. *Pregnancy* often gives rise to error. It may be co-existent with dropsy, or it may be called by that name for the purpose of concealment, and the surgeon be misled. If the health is generally good, it may be suspected; the application of the hand for a few minutes over the abdomen, after the fourth month of utero-gestation, will usually detect the motion of the fœtus; or lastly, if doubt still remain, an examination *per vaginam* should be made.

The *distended bladder* from retention of urine, is, from its fluctuating feel, sometimes mistaken for dropsy. A few questions and an examination will generally detect the error, (see a case in Sir A. Cooper's Lectures), which the passage of a catheter will reveal.

Encysted Dropsy of the peritoneum, and tumours in the abdomen are of rare occurrence, but as they mislead, deserve to be mentioned. *Hydrops Uteri* is also a very uncommon disease; it is attended by deranged catamenia; the sound on percussion is dull; the fluctuation obtuse; there is constipation, and retention of urine. *Ovarian dropsy* is distinguished from ascites by its commencing on one side of the belly; the fluctuation is less distinct; it is limited and circumscribed; the sound is more dull, and the abdomen irregular and knobbed. It may occur during the enjoyment of good health, which is long in becoming impaired. The size to which it attains is sometimes enormous, and the water is often mucilaginous and ropy. But in ascites it is usually serous, colourless, transparent and inodorous; at times lactescent; mixed with albuminous flakes; gelatinous or like syrup. An ovarian dropsy should not be operated on in its early stage; but, after the smaller cysts have been ruptured by their distension, and a common one alone remains. Paracentesis is sometimes, though rarely, followed by complete recovery.

PUNCTURING OF HYDROCELE.

Note VI, p. 235.

A hydrocele may be cured by blisters, the moxa, muriate of ammonia in alcohol, astringent cataplasms, and mercurial ointment; or, if recent and traumatic, may get well spontaneously. This is very rare. Cautery, incision, excision of a portion of the sac, setons, &c., have all yielded the precedence to injection as a method of permanent cure.

A hydrocele may be known by its commencing at the *bottom* of the scrotum, and its rapid increase. It is not uncommon to perceive a sort of constriction, or ring, around its central circumference. It is remarkably light for its size, and very translucent. The diseases with which a hydrocele may be confounded, it is essential to be well acquainted with; they belong either to the testicle, or are external to it. Among the first, are sarcocele, hydatid tumour, and the still more deceptive complication of hydro-sarcocele; among the latter, are hernia, hæmatocele, hydrocele of the chord and varicocele. With all these, likewise, true hydrocele may be complicated, and it is very important for a young surgeon not to introduce a trocar, to draw off water from a tumour in which none exists, the case being one or other of these diseases. We have seen a diseased testicle, in which there was both fluctuation and translucency, tapped as for a hydrocele, by a surgeon whose tact is unsurpassed; and two of the most eminent professional men of our city, removed a testis for a supposed affection of the gland itself, which, upon examination, proved to be a hydrocele. Sir A. Cooper mentions a similar occurrence for what proved to be hæmatocele. Should a hernia be punctured for a hydrocele, life would be the forfeit of the error; and, on the other hand, should a hernia be supposed to be hydrocele, life might be equally hazarded. The latter may co-exist; and in the Clinical Lectures of Baron Dupuytren, on Surgery, a complicated case of this kind is related, in which a carcinomatous enlargement of the testis, a hydrocele, and an accidental congenital hernia, capable of spontaneous reduction, existed together. The alternate ascent and descent of the latter, caused a variation in the size of the tumour, and a peculiar arrangement of the epididymis prevented the water of the hydrocele from passing into the abdomen. An incision down to the sac was made, the fluid evacuated, and the testis removed. In the note on Hernia we shall enter more fully into this diagnosis.

A *sarcocele* is hard, whilst a hydrocele is soft and elastic; but, *vice versa*, hydroceles are sometimes very hard, and sarcoceles not so much so. A sarcocele is never transparent, nor is a hydrocele always so. A sarcocele is heavier than a hydrocele; in the latter, when pressure is made upon the posterior part of the tumour, pain is felt from the sensitiveness of the testicle; in sarcocele, the feeling is alike in all parts, and in it, the upper part of the chord may be felt. Mistakes are easy, but by care, tolerable precision may be attained.

Fungus hæmatodes of the testicle is remarkable for its fluctuating feel, and has been punctured for hydrocele. It is, however, heavier, not in the least diaphanous, and always begins in the gland itself, and not at the bottom of the scrotum. In *hydro-sarcocele*, the water usually forms subsequently to the disease in the gland, which is much enlarged. The immense size of an *hydatid* testicle, its flatness, its weight, and the circumstance of its fluctuating only at certain points, will serve as guides to a detection of its nature. It is a rare disease. In no doubtful case ought a trocar to be plunged into the tumour; but an incision should be cautiously made through it with a lancet, or a scalpel.

An operation for hydrocele in young children, whether congenital or not, is very seldom required, as the water will generally be absorbed. In aged persons, simple as it is, it may prove fatal. In performing the operation, the trocar is to be passed in on the *anterior, outer and lower part* of the tumour, obliquely *upwards* and *inwards*, so as to avoid the testicle, which is usually situated posteriorly. For the injection, after the fluid is evacuated, port wine two parts and water one part, may be substituted for the red wine mentioned in the text; but alcohol, tincture of camphor, brandy one part, to water ten parts, cold water, &c., may be used in its absence. Dr. Mott is very successful with one drachm of sulphate of zinc, to one pint of tepid water. If the injected fluid does *not* flow out when required, and the scrotum is distended, it has passed into the cellular membrane. We have before recommended that for this occurrence free scarifications down to the tunica vaginalis should immediately be made with a lancet, or a scalpel, and emollient poultices applied. Some sloughing must ensue, and requires appropriate treatment.

The inflammatory symptoms after the operation may demand antiphlogistic measures, venæsection, leeches and opiates; sometimes even matter forms, and requires puncturing for its exit. This is seldom seen.

The manner of the obliteration of the sac is this. Matter of a lymph-like kind is effused into the tunica vaginalis, and begins to be absorbed when the swelling declines. Its concrescible part becomes organized, is traversed by vessels, and insensibly blends itself with the two walls of the vaginal tunic. Changing then, into cellular tissue, it solders together the sides of the serous cyst, until that is completely obliterated.

The operation for hydrocele may be attended with a wound of the testicle, or with bleeding. The first is owing to the impossibility there sometimes is, of detecting the situation of the gland, which occasionally lies at the front part of the scrotum. It produces great pain, and sometimes results in suppuration and loss of the prolific organ; but, on the whole, it is less dangerous than might be imagined. The

bleeding is never alarming, but may form an hæmatocele, which will require to be punctured.

THE PUNCTURING OF HYDROCEPHALUS.

Note VII, p. 237.

Tapping having been more successful in the treatment of that intractable affection, Hydrocephalus, than medicine, which is productive of little effect, it may be proper to propose its performance, when the failure of other means is apparent. Like other punctures, it does not demand the possession of much anatomical knowledge, nor is the little patient usually the worse for the operation. We have therefore given it a place with the three kinds of puncture described by the author.

The water in this disease, collects in the inner surface of the ventricles, and goes on to soften and distend the cerebral mass, which becomes as thin as paper, and resembles a membranous bag; the convolutions, being elevated to the level of the gyri, are obliterated. The sutures, according to Dr. Craigie, are not separated, but they are prevented from forming; and he asserts, that the fissure between them subsequently closes, not by any re-approximation of the bones, but by an ossification of the membranes, the dura mater and pericranium. Be this as it may, the head attains an enormous size, as will be seen by the case mentioned below; the bones are widely separated, and the whole has a translucent appearance, which has been compared to that of a lanthorn. This, together with the symptoms, the shape, size, and fluctuating feel of the head, will warrant us in undertaking the operation. The integuments between the sutures, may, when very much distended, be punctured with a lancet, a bistoury, or a cataract needle which is broad and spear-pointed. This simple procedure succeeded in effecting a cure in the hands of Dr. Vose, of Liverpool; the case is contained in Vol. IX, of the Med. Chir. Trans. When it is required, however, to penetrate to a greater depth, and to enter the ventricles themselves, a very delicate trocar and canula are to be selected. A laced cap is to be at hand, to be applied after the operation; also a double headed roller bandage, basins, some brandy, &c.

The double headed roller being put around the head, from forehead to occiput, the ends are crossed and given to an assistant, who is to *tighten them gradually as the water flows*, to guard against the collapse which the sudden loss of pressure would occasion, and which has been fatal. For this reason also, the whole quantity in the brain should not be evacuated at one tapping, eight ounces being as much as it is prudent for an infant of three or four years of age to lose at a time. The child is to be placed upon the knees of an assistant. The surgeon then, holding the trocar in his right hand, passes it in at the anterior fontanelle, through the integuments and membranes, *on one side or other* of the longitudinal sinus. This being done, he withdraws the stylet, allows as much water as it is prudent to draw off to flow through the canula, then withdraws the latter, and closes the wound with a piece of adhesive plaster; the roller bandage is then removed, the head rubbed with brandy, and the laced cap applied as tightly as the child can bear it.

The water re-accumulates, and the puncture may require to be often repeated; for the disease has been found to yield to a second or third evacuation, where it has triumphed over the first. In Dr. Vose's case, three tappings were sufficient. Beside this gentleman, Mr. Russel, of Edinburgh, has succeeded in one case by the operation, and Dr. Conquest, of London, in two cases; and though a distressing one, it seems to promise success under many circumstances, in which medical art is unavailing.

We are indebted to Dr. J. Sickels, jr., for the following dimensions of the enormously enlarged head of a child, not quite three months old, with congenital hydrocephalus, which came under his observation, and in which tapping was twice resorted to, but without beneficial results. Circumference of the head, twenty-three and three quarter inches; measurement across from the mastoid process of one side to that of the other, seventeen inches. This is, perhaps, for the age of the child, as extensive as can be found upon record.

VACCINATION.

Note VIII, p. 248.

The interesting and minute details into which M. Bourgery has entered upon the subject of vaccination, leave but little to be desired. In this country, however, we are in the habit of introducing the vaccine virus by a process which differs from any that the author has described, viz., by *scarification*. With the point of a thumb lancet, we make a number of little scratches parallel to each other, upon the arm, over the tendinous insertion of the deltoid muscle, about the eighth of an inch long; and these perhaps are intercrossed by others. A little blood only should ooze from these superficial incisions, which give no pain. We next rub the instrument containing the virus over the scarified part, until we believe the whole to have been wiped off by the blood, and then desist from the operation. The blood is allowed to

coagulate over the scarifications, and great care is afterwards taken to guard against the least possible friction or pressure upon them; for experience has shown, that if injury be inflicted during the period of incubation, the vaccination may fail; and that if, during that of inflammation, the structure of the vesicle be altered, or its regular progress disturbed, so that it does not run its stages, it will not preserve from subsequent infection. If the matter be wanted, the vesicle is punctured *on the eighth day*, at several points of its circumference, one at a time; drops of virus ooze from the punctures, are collected on the ends of the convex surfaces *of pieces of quill*, and are then ready for immediate use. Five or six pieces of quill (called *points*) are generally charged from one vesicle; and during this operation, as little irritation should be inflicted as possible. The sooner the quill is used after it is charged, the better.

With regard to the exhaustion of the power of vaccine virus in the system, it is an opinion which gains ground; it has many advocates in this country, and the Royal London Vaccine Institution has lately arrived at the same conclusion.

CATHETERISM.—*Enemata.*

Note IX, p. 249.

The application of conducting catheterism is spoken of under the head of œsophageal catheterism, further on. A not less important application of it is for the throwing up into the rectum of enemata, and of injections into the nose, vagina, fistulous passages, &c.

Clysters are useful as a means of overcoming constipation, of promoting the effect of cathartic remedies, of introducing astringent, narcotic, or antispasmodic remedies, either for the cure of disease of the rectum itself, or for that of other affections. Lastly, when from any cause, the passage into the stomach is occluded, or food cannot be introduced into it, clysters furnish a valuable means of supporting life until the original malady can be removed. For the administration of enemata, various instruments are employed. Those of Read and Jukes are admirable for this purpose, as domestic appurtenances. The *bidet* likewise affords a convenient instrument for the chamber, and enables the patient to administer the remedy for himself. Pewter syringes, of various sizes, are sold in the shops; but they are clumsy and unmanageable, and having metal, inflexible pipes, may, unless great care is used, do injury, of which many cases are recorded. The adaptation of gum-elastic tubes would, no doubt, add much to their safety and utility. The pipe and bladder, which is at once cheap and convenient, or the oiled silk bag, having, according to the recommendation of Dr. Chapman, a large flexible catheter fixed in it, are greatly superior. "It," says Dr. C., "is easily introduced, gives no pain from the readiness with which it accommodates itself to the course of the intestine, and by reaching up to some distance, so disposes of the matter of injection, as to secure its retention and perfect operation.—*Chapman's Therap., Vol. I. p.* 280.

The bladder, or bag, should be capable of containing at least a pint. One end is open, the other tied around the pipe or tube, into the inner end of which a cork is passed, attached to a string which hangs out of the bag to some distance from its upper orifice. The tube being stopped, the bag is filled through its upper aperture, which is then gathered up and tied tightly with a string, to prevent the escape of the liquid. The pipe is introduced *in ano* beneath the bed-clothes, the patient lying on his left side, or on his back, with his thighs drawn up and apart. The operator then, supporting the bag in his right hand, extracts the cork by pulling on the string, and squeezes on the fluid with his left; and when the whole of it has been passed up, and the bag is flaccid, he withdraws it, and, if necessary, re-fills it and repeats the process. If a bladder be employed, it should be allowed to soak in warm water before it is filled with the matter of injection, to make it pliable. Injections for fistulæ, the ears, &c., are performed with small syringes of pewter, or of ivory, which have long tapering tubes; others, for the vagina, &c., are perforated generally with five holes at the lower extremity of the pipe, which is bulbous and rounded.

The following is a good domestic purgative enema:—R. Sulph. Magnes. Melasses, Ol. Olivar., aa ℥j. Aquæ Calid. lbj. M.

CATHETERISM.—*Bougies.*

Note X, p. 250.

Upon the subject of evacuatory catheterism the author has been full and minute. But not less important to the young practitioner is that species of catheterism, which has for its object the dilation of *stricture*, in whatsoever passage it may occur. The four situations, however, in which he will be most often called upon to prescribe for this affection, are the urethra, vagina, rectum and œsophagus; a brief account of the operation and instruments intended for each, belongs properly, therefore, to the object of this work.

Stricture of the urethra, besides being merely a cause for the introduction of a

catheter, is in itself a disease, which calls for treatment of various kinds. Forced injections, dilation, cauterization, incision, and forced catheterism, have all been employed for its cure. Of the second method only, are we here permitted to speak. Dilation is the more common mode of treatment, and that which should be first attempted. Wax, gum-elastic, whalebone, flexible metallic, and steel *bougies*, are the instruments for effecting this object; although by some, catheters themselves are used for the purpose. The wax bougie should be supple, soft, not fusible in the part, capable of moulding itself to the canal, and not brittle. Gum elastic bougies ought to be yet more supple; they are very smooth, round at their point, from nine to eleven inches long, half a line to four lines, or more in diameter, either cylindrical, conical, or swelled, &c. A conical bougie is not easily retained; the swelled bougie is a better instrument. Its whole effect is concentrated on the stricture, and its situation is easily maintained; and it admits of our carrying the dilation to whatever degree we please, with less pain than any other. A hollow instrument of this kind is sometimes less stiff, dangerous, and painful to the urethra, than a solid one.

In a *permanently* strictured urethra, it is not always easy to pass a bougie. If it is delicate, it bends; if it is too large, it cannot pass. A catgut one, in the first case, offers some advantages. In introducing a bougie, the patient may lie, sit, or stand. Catgut bougies, if very smooth, enter the urethra readily, easily bend before any obstacle; and, as they quickly swell with the moisture of the part, produce a speedier and less painful dilatation of the stricture than gum-elastic ones do. They are of different sizes, and may be changed for others of larger dimensions, several times in a few hours. The penis is to be raised a little, and sometimes to be lowered and drawn forward; it is held in the left hand, and the bougie, which must be previously warmed and oiled, between the thumb and fore and middle fingers of the right hand. The failure of a first trial is no criterion for the success of the second. If the bougie meets with resistance, it must be rotated on its axis between the fingers, having been withdrawn a few lines, and then again pushed onwards. A cul-de-sac, a fold, a lacuna, or a false passage, &c., may act as an obstacle; and to overcome it, the bougie must be gently pressed on, retracted, or its inclination varied; or, the finger upon the perinæum must facilitate its progress. If it stops and does not recede, and is as it were compressed at the point, it is in the stricture; if it retracts on a cessation of pressure, it is still in the canal. If it is too large to advance, it must be changed for a smaller one, or for one of a different form.

If the stricture is *spasmodic*, venæsection, cold applications, leeches, belladonna to the perinæum, the tincture of the muriate of iron, a solution of tartrate of antimony, the warm bath, &c., should be resorted to. It is of short duration, and does not so often require the use of the bougie as the permanent one. If it should, however, be attended with retention of urine, or occur during the introduction of an instrument into the canal, it sometimes answers to leave a bougie down in the stricture as far as it will go, for an hour or more, after which it will pass easily for a considerable distance. This is sometimes productive of unlooked for success. The bougie best adapted to this particular purpose, has a very thin, smooth, supple, filiform point.

Suppose the bougie to have passed; we leave it in for half an hour, one, two, or even for twelve hours, which depends on a variety of circumstances. Three days may elapse before we can re-introduce it; but sometimes, it may be possible on the following day. Each time a larger one is used. As the sittings become more frequent, we increase their duration. Three months may be demanded for the cure of permanent stricture; whilst in some, twenty days, and in others, six days, may suffice. Many persons faint, or have chills, sweats and fever, upon the application of the bougie; but these effects need create no uneasiness, as they soon disappear.

Of the symptoms of stricture, we cannot here speak; its causes are injury, gleet, gonorrhœa, or an irritable state of the canal.

The cure of stricture by caustic is not often required; it is painful; and in unskilful hands, dangerous. To describe it is not within our scope.

We are permitted to say, as a general rule, that whenever the *smallest* bougie can be passed through a stricture, that stricture is curable by dilatation. (*Velpeau, Med. Operat. S. Cooper's Surg. Dic.*)

Of the bougies used in strictures of the œsophagus, we shall speak under the head of œsophageal catheterism. Stricture of the vagina is often congenital, and frequently acquired; the knife must be used to overcome the contraction, and sponge, tents, lint, or a gum-elastic or metallic tube, should be introduced to secure the permeability of the passage. The rectum, like the vagina, is liable to stricture, either cancerous, or purely organic; bougies, and various tents and contrivances are employed for its cure.

CATHETERISM.—*Catheters.*

Note XI, p. 266.

Of all the causes mentioned by the author, from which a retention of urine may arise, and the use, of a catheter be demanded, enlargements of the prostate gland,

paralysis of the bladder from distension, injuries of the spine, inflammatory and spasmodic strictures laceration of the perinæum and urethra from falls, &c., are the most frequent. The first of these diseases is often met with in the old, and gives much trouble in the passage of the instrument, although it can generally be got into the bladder. Over-distension of the bladder from a neglect of its evacuation, blows, injury of the vertebræ, &c. give rise to paralysis of the organ, which it will then be necessary to empty with an instrument at frequent intervals. A catheter passes in a sound urethra without difficulty. The treatment of inflammatory stricture was mentioned under the head of bougies. All suitable depletory treatment must be practised; and if a catheter will not pass, the bougie should be introduced in contact with the stricture, as there described. Laceration of the urethra, and fistulæ of the perinæum, call for the use of the catheter as a means of preventing the urine from escaping among the neighbouring parts. In the first of these cases, its introduction is often most difficult. In them, and in enlargements of the prostate gland, the instrument will require to be retained for a considerable time; if, therefore, the gum-elastic instrument can be passed, it is better, as it incrusts less easily than the silver or metallic one.

A circumstance of vast importance connected with a retention of any standing, the author has neglected to detail. It is, that urine will escape by stillicidium from a distended bladder, after it has continued to be so for some time. To the patient and to his friends, this is a source of consolation and rejoicing; but, if it should be considered by the physician as no longer to demand the use of a catheter, and he therefore neglect to employ it, the distension, of which the trifling discharge is now a symptom, will increase, until after agonizing suffering, the bladder sloughs, discharges its contents into the peritoneal cavity, and the patient dies.

Catheters are of two kinds, curved and straight: the latter are easily pushed on by rotation on their axes, and with them, obstacles can be passed, which other instruments would not surmount; but the former give less pain, enter more readily, and are in every respect preferable. Too great a curve is useless, and interferes with the motions of the hand. The most convenient metallic instruments are those, which are curved only in their posterior fourth, so as to form a bow the cord of which shall not be longer than three or four inches, nor the radius more than two or three; the more the axis of the point is directed backwards, the more difficult it is to pass them into the bladder. When the urethra is sound, a rather thick catheter had better be employed; but, on the other hand, if the passage is obstructed, a small one should be preferred. Metallic catheters are now rendered more convenient by the addition of a flat wooden handle, through the centre of which the tube passes, its pavilion projecting about half an inch above the level of the top. Elastic catheters will often pass when a metallic one will not. All lacunæ, &c., exist in the lower wall of the urethra, and as it is flexible and unsupported, it is easily torn; hence, false passages occur chiefly in it. Curved instruments should, therefore, always follow the upper wall.

A catheter has been contrived by Sir A. Cooper, called the *prostate* catheter, with which it is proper that all should be provided. It is made of silver, and is two or three inches longer than any other in use. It is stated by Professor Mott, in his lectures, that it will very often pass when no other would enter at all. In his hands, it has always been successful when others had failed, and, like other eminent surgeons, he has never been compelled to puncture the bladder. In using it, it should be tilted up when it gets to the prostate, and will then pass with facility. Sir A. Cooper advises that it should be fourteen inches long, and a quarter of an inch in diameter.

The great risk in passing a catheter or a bougie, is that it may lacerate the urethra, and give rise to *a false passage*, by rupture of its thin and yielding coats. If this misfortune occur in the bulbous portion of the urethra, the instrument may plough its way along the perinæum and recto-vesical septum, and enter the rectum. Still more dangerous would the false passage be, if it occurred high up between the posterior surface of the symphysis and the fore part of the bladder. Urinal infiltration would bring about inflammation of the pelvic cellular tissue, which would almost inevitably prove fatal. False routes through the prostate are much less dangerous, but still give great trouble, and entail much mischief. Into the passage thus improperly formed, the bougie will afterwards pass; and the utmost care should be taken to avoid making it, by close attention to the excellent rules laid down by the author on the use of the instrument. As soon as it is perceived to be forming, we are to withdraw the bougie or catheter, and do all we can to regain the urethra. If it communicate with the bladder, we must leave the instrument behind, until a gum-elastic one can be passed in, and allowed, for several days, to remain. Lastly, when infiltration is beginning, we are unhesitatingly to cut freely down upon the supposed track of the false passage, as the only means of limiting the spread of the evil, and of preventing the mortification of the tissues. During the passage of a catheter, hæmorrhage may come on and be really alarming.

By pressing on the perinæum in different parts, with the finger, we may detect the seat of its origin, which is generally opposite the symphysis pubis. If a compress be there applied, and secured with a roller bandage, it will cease.

Lastly, there are strictures so bad and intractable, as that no instrument can be passed, and this will call for the performance of an operation.

ŒSOPHAGEAL CATHETERISM.

Note XII, p. 271.

Instruments are passed into the œsophagus for purposes not alluded to in the text; viz., for the extraction of foreign bodies, which have become lodged there in deglutition. Among these are bones, fish bones, pieces of cartilage among the food eaten, bread, lumps of meat, pins, needles, nuts, &c., which have been swallowed unawares, and remain fastened in the upper part of the canal. It will at once be seen that these are cases of frequent occurrence, which every practitioner should know how to remedy without delay.

No sooner has a foreign body become lodged, than a sense of strangulation is perceived; violent convulsive efforts to vomit are made, the face tumefies, breathing is embarrassed, and a mixed expression of pain and terror is depicted on the face of the sufferer. The nearer the orifice, the more violent are the symptoms; they soon subside, and a difficulty of deglutition and fixed pain take their place. If the body is sufficiently large to press upon and close the glottis, imminent, and perhaps fatal suffocation may ensue. If it have descended below the larynx, this is no longer to be feared. In this case, it must either be rejected, extracted, or must ulcerate its way through the œsophagus and adjacent tissues. Pins and needles pass in the latter way, to enormous distances, without giving rise to unpleasant symptoms. On the other hand, these eliminatory efforts are far from being always equally happy; abscess, scirrhus of the œsophagus, and fatal dysphagia, with many anomalous ulcerations of the trachea, aorta and carotid arteries, &c., have been known to follow the occurrence; which, therefore, presently or prospectively, must be treated with energy.

To do this, we are first to ascertain whereabouts the foreign body is lodged. We place the patient near a window, with his head thrown back upon the chest of an assistant; he is then to open his mouth widely, and the surgeon, depressing the tongue with a spoon, &c., is to examine the throat. If the body can be seen or felt, a pair of long and curved forceps passed closed into the pharynx, will suffice for its extraction. If it be, however, out of sight, catheterism is called for. The instruments which have been contrived for this purpose, are, first, M. Dupuytren's. It is a silver stem, with a ring at one end, and a round ball of various diameter at the other; it is strong, though flexible; and its length is eighteen or twenty inches. With this, he ascertains the depth at which the substance is, &c. As a general rule, it is better always to extract it, than to force it into the stomach. Needles, pins, spoons, forks, knives, and pieces of money, should always be removed, for they are sharp, and may do more harm in the stomach than in the œsophagus itself. Any thing which the gastric juice is capable of digesting, may be safely passed downwards. Instruments for the latter purpose are called *probangs*, and consist of long pieces of whalebone, with a bit of sponge firmly fastened at the end.

Among the instruments for the extraction of foreign bodies from the œsophagus are, 1st, a flexible silver, or whalebone stem, with a blunt hook at the end; 2d, a flexible catheter, into the eyes of which some loops of silk are passed and allowed to hang loosely; 3d, an instrument of the same kind, with small metallic rings, linked in the manner of a chain. The instrument is to be passed below the foreign body, if possible, and then drawn up by a rotatory motion, when the rings will often entangle and bring with them small and slender bodies. Great force is often needed to extract them. Long and flexible forceps are perhaps still better. The trial of these means may, perhaps, be combined with the exhibition of emetics, which not only tend to dislodge the foreign substance, but produce relaxation. For the same purpose, enemata of tobacco have been employed. The foreign body having resisted every attempt to alter its situation, œsophagotomy, if it be lodged in the cervical part of the œsophagus, may be practised; if it be below that, we must leave it to itself, and patiently await the event.

Children often stuff paper, wax, peas, beans, beads, shot, &c., into the outer meatus of the ear, and into the fossæ nasaliæ. Insects also enter the ear during sleep; and by the titillation they create, may give rise to convulsions, delirium and death. If the foreign body in the ear should ulcerate through the tympanum, the case may end fatally by inflammation and abscess of the brain. Examination in a strong light, the ear being pulled upward, often detects the substance; and if it be a hard one, forceps, a blunt hook, or scoop will often suffice to remove it. Insects, after they have been killed by the introduction of oil into the ear, are easily taken away by the same means; or, they may be extracted by gluing them with honey, or tur-

pentine, to some lint which is introduced twisted around a thin stick. Foreign bodies in this place, cannot always be removed, nor will suppuration always cast them off; in which case, terrible consequences have been known to ensue. Foreign bodies in the nose may be dislodged by sneezing, by forceps, or blunt hooks, single or double; or, by the performance of catheterism, from the posterior fauces outwardly by the nostril, with the catheter of Bellocq. These cases are much less serious than the preceding, either in their consequences, or in the difficulty of their treatment.

(*Dict. de Med. et Chir. Prat.*)

REDUCTION OF HERNIA.—*Diagnosis.*

Note XIII, p. 277.

Before we proceed either to reduce a hernia, or to perform the operation for its return, we ought to be very certain that it really is that disease which is before us. From the facts now to be mentioned, it will appear that numerous, and in some instances fatal errors have arisen from mistakes made upon this subject. Encysted hydroceles of the chord, and those of the tunica vaginalis, have been treated for herniæ. Varicose dilatation of the veins of the chord, and of the saphena vein on the thigh, have also been mistaken for that disease. Fatty tumours of the groin frequently simulate omental hernia. The ganglia of the groin are liable to inflame and suppurate and to form tumours in that part, which induce similar errors; one of these was operated on, with all suitable precaution, by no less a man than M. Sanson. Aneurisms are likewise here met with, one of which was opened by Guattani, and another punctured by Mayer. Mistakes between psoas abscess and femoral hernia are very common. On the other hand, a hernia may really exist, and be mistaken for some other disease; with this impression, it may be either punctured, poulticed, or opened by caustic, if considered to be an abscess, or neglected as an enlarged lymphatic gland, in either of which events the life of the patient must be jeopardized.

As, however, the confounding of a *hydrocele* with an inguinal hernia, is the most frequent of these occurrences, we shall here redeem the promise made in the note on that subject, and proceed to give the diagnostic signs by which the two affections may be discriminated; premising that the two may co-exist in the same individual, and the hernia become strangulated. We are to ask where the tumour first began; to enquire the cause of its occurrence; to ascertain whether or not, it is reducible, and if it be acted on by coughing. If it began at the bottom of the scrotum and increased gradually without any known cause, or from some local injury; if it does not dilate on coughing, and cannot be returned, it is probably a *hydrocele*. The latter sign, however, is uncertain; for, if it is a congenital hydrocele, all the water will re-enter the abdomen, and so lead us to suppose that we had reduced a protrusion of intestine. Therefore, we are to place our fore-finger over the internal abdominal ring, let the patient cough, or rise from the recumbent to the erect position. If the case be a hernia, the scrotum will remain flaccid and empty; if water be present, it will trickle past the finger, and soon distend the scrotum as largely as before. Again, if it be a hernia, the moment that the finger is taken off the ring, and the patient is made to cough, the intestine re-protrudes. Still, if the hydrocele grows so large as to reach to the abdominal ring, or the hernia be irreducible, it is easy to confound the diseases; and no operation should be rashly performed for the cure of either. A varicocele, or cirsocele, dilates on coughing, swells in an erect and subsides in a supine posture. Here, again, the horizontal position is to be assumed and the tumour pressed upon; if a hernia, it goes up; if blood, it disappears. If the case be a varicocele, when the patient rises, the pressure upon the vessels prevents the flow of blood into the abdomen, and the tumour grows larger than before. If a hernia, no tumour appears whilst the pressure is kept up with the finger.

It is not easy to be deceived when there exist symptoms of strangulation in a tumour in the seat of hernia: although, even here, errors are capable of being made. Swelled testicle is attended with pain, vomiting and constipation, and is, according to Mr. Colles, one of the most difficult diseases to discriminate, particularly when it has not descended into the scrotum, but remains in the inguinal canal. Abscess and cirsocele have been attended with the same symptoms, and various medical diseases have phenomena in common. Nothing but the utmost care and knowledge of the history and diagnostic marks of each of the affections now mentioned, with considerable *tactus eruditus*, can save the surgeon from occasional error, if his practice is extensive.

A kind of hernia exists, against which the surgeon should be upon his guard; it is that which remains in the canal, or behind the external abdominal ring. We may, as we suppose, succeed in reducing it by the taxis; whereas, the symptoms may continue and death may ensue. It will then be found that the hernia is still situated behind the external ring, and there it may be yet strangulated; and if the surgeon is not guided by the symptoms and a knowledge of the fact, it may sphacelate and prove fatal.

THE TAXIS.

Note XIV, p. 281.

In order to attempt the taxis of hernia with any prospect of success, two things are necessary to be known. First, the kind of hernia which is before us, whether inguinal or femoral; for upon this will depend the efforts and the position, &c., for the reduction. Secondly, the particular method of acting in either event. In addition to the two above mentioned, we have herniæ protruding directly at the outer abdominal ring, called *Direct:* and herniæ which are emerging at the inner ring, pass along the inguinal canal and protrude at the outer ring, and perhaps come down into the scrotum: these are *Indirect* inguinal herniæ. The long axis of an *Indirect* inguinal hernia, which is of the most common occurrence, is in the direction of the chord obliquely, midway between the ilium and the pubis, and *above* Poupart's ligament, or the crural arch. If it is in the scrotum, there can be no doubt that it is inguinal. *Direct* inguinal hernia always protrudes directly forwards from the external abdominal ring; is nearer the penis, and, if it is oblique at all, is so towards the navel. For anatomical reasons it is a rare disease. A *Femoral* hernia will, of course, always protrude *beneath* Poupart's ligament. It is often small, and if we can detect the arch above it, we need never be mistaken. But this cannot always be done; and it should then be remembered that its long axis is across the thigh. If doubt still exist, let Mr. Colles' rule be remembered, that the neck of an inguinal hernia is *above* the tuberosity of the pubis, and that of femoral hernia *below it, and on its outer side.*

THE TAXIS.—*Inguinal Hernia.*

Note XV, p. 282.

We may now perceive the practical utility of the division made in the above note, of an Inguinal Hernia into *Direct* and *Indirect*; and the necessity for correct diagnosis. In the taxis of a *Direct* inguinal hernia, the pressure should be directed upward, and a little inward. In that of an *Indirect* inguinal hernia, we are to grasp the tumour and raise it towards, but not against the abdomen; to compress the neck of the hernial tumour, and push it towards the iliac spine, slightly upwards, and in the direction of the inguinal canal. Thus we perceive, that in these two species of hernia, the taxis is not identical; and they deserve therefore to be discriminated, as a guide to their more safe and certain reduction.

THE TAXIS.—*Femoral or Crural Hernia.*

Note XVI, p. 285.

The procedure in this species of hernia is yet more different inasmuch as it *tilts* up from *under* Poupart's ligament. The surgeon, therefore, must draw down the fundus of the tumour, with both thumbs, into the hollow or groove on the forepart of the limb; he is then to press it backwards, as if to sink it into the thigh; when it is far enough back to be on a line with the crural ring, he should push it a little outwardly, and upwards into the abdomen. If the tumour is pushed up at once, it will be doubled on itself and made worse. Now, it is obvious that for the other species of hernia, this treatment would be unavailing; and, when it is considered how dangerous are both the disease and the operation, and how important it is for the patient and the surgeon that the taxis should succeed and its principles be understood, we hope that the digression as to the diseases for which it may be mistaken, and the diagnostic precautions it requires, may not be taken amiss.

Nothing can be a better aid to the student and young practitioner, in remembering the treatment of herniæ of all kinds, than to bear in mind the way in which Mr. S. Cooper has considered them in his Surgical Dictionary. He there divides herniæ into, 1st, such as are reducible, easily and immediately; 2d, such as are irreducible, and *not* strangulated, troublesome, or dangerous. 3d, such as are strangulated, whether femoral, inguinal, &c.

The *first variety* will require the taxis, according to its kind, and the subsequent use of a truss. For the *second*, the taxis must be attempted, and various means for succeeding in the manipulation adopted, as laid down by the author in the text; or, if they fail, the tumour need only be supported by a suspensory to guard against further protrusion. The *third* and most important variety calls for the most energetic treatment; the taxis and the adjuvant means should be assiduously practised as long as prudence will justify the delay; and if unavailing, the operation must be relied upon as the final resort.

WOUNDS.

Note XVII, p. 289.

Into the general features connected with these accidents, the author has fully entered; but, from any particular investigations into the subject, he has carefully abstained. The translators have endeavoured, in this note, to supply a few deficiencies with which they were struck, as well as a few leading principles which

they have collected from standard authorities; conscious, however, how very imperfect, after all, must be their attempt, when the full extent of the topic itself is considered.

A lacerated wound requires to be cleansed from dirt, &c., and its flaps laid down with adhesive straps placed loosely on. Poultices are at first generally called for; after a time, that portion which has sloughed, falls off, and healthy granulations begin to form. In any constitutional treatment which may be adopted, the tendency of these wounds to tetanus and sloughing should be borne in mind. If the injury is of a kind to make us dread the former, it is better at once to remove the part, for to amputate after the accession of locked jaw, is unavailing. When a limb is removed by an injury of this kind, amputation higher up is generally required. Cart-wheels, machinery, cannon-balls, the uncoiling of ropes, &c., are generally the causes of these accidents.

1st. *Wounds of the Head.* This class of injury is common and interesting. In the scalp, incised, contused, punctured and lacerated wounds occur. The *first* heal generally without difficulty, by their edges being merely placed in contact with adhesive straps. Stitches, if possible, should be avoided. From simple, as from large incisions and punctures, severe erysipelas often occurs, involving the scalp, face, eyes, &c.; it is alarming in appearance, and though seldom, sometimes fatal. Matter may form beneath the muscles and fasciæ, and will require to be evacuated; if not, the pericranium may slough and the bone may exfoliate. Extensive laceration of the scalp heals kindly, and the latter should never be removed. Clean it, lay it down flatly, strap it, and it will adhere.

An incision, from a sabre-cut for instance, may enter the brain. The brain itself may also be lacerated, with or without an external wound. Sometimes the injury proves quite harmless, and affects neither the body nor the mind; large portions even, may be lost with impunity. Compression, inflammation, and fungus, are however, to be dreaded. The treatment of the first two is known. The third is to be pressed down by lint and adhesive plaster, until the dura mater heals over it.

In injury of the head, the harm done to the brain is always dangerous. Severe internal lesion occurs often without external injury, and is of two kinds; concussion and compression.

Concussion is a shock which the brain receives, more or less severe, attended with laceration or not; it may accompany contusions and lacerations of the head. It may be soon recovered from; it may continue until death, or it may merge into symptoms of compression. In the first case, subsequent inflammation of the brain is always to be feared, although a deceitful lapse of weeks may pass over.

It is a popular error, that a person lying in a state of stupor from concussion, should forthwith be bled. This is irrational conduct; rest, a little wine and water, or frictions, are all that should be directed, until the effect of the blow goes off; then, when reaction ensues, venæsection is highly proper, to guard against ulterior accidents.

Compression is pressure upon the brain, made by the presence of blood, serum, matter, or bone, either between it and the dura mater, or between the latter and the skull. The three great indications of this condition are stertorous breathing, slowness of pulse, and dilation of the pupils of the eyes. It may either be immediate, or may occur some time after the accident has happened. In the latter case, the sudden unhealthy alteration of the external wound, if there be one, which becomes flabby and œdematous and discharges a thin fluid; or, if no wound exist, the elevation of a puffy tumour in the scalp, may be considered as decisive evidences of its supervention below. These cases call for the trephine. All dressings which are applied to the scalp should be allowed to remain on as long as possible, and the former ought to be shaved before they are put on. A simple fracture of the bones of the skull is not in itself dangerous, unless the external violence shall have done mischief within; and if of this there is no evidence, nothing but the usual depletion should be practised. If the scalp is lacerated and bone depressed, although no symptoms of compression are present, the latter must be removed by the elevator, or trephine. Thirdly, a fracture with depression, no external wound or compression existing, requires no operation. Fractures which occur at the base of the skull are generally fatal.

2d. *Wounds of the face*, though very simple, are attended with two circumstances which deserve notice. The one is contusion or incision of the *pes anserinus*, or the division of the facial nerve, portio dura of the seventh pair, after it has perforated the parotid gland and is distributed on the cheek. The result of this would be paralysis of the muscles to which it goes, as muscles of respiration; a fact of no practical moment, but which it is well to know, as a means of explaining the symptoms with which the wound might be attended.

The second is wound by incision, laceration, puncture, &c., of *the duct of the Parotid Gland*, as it crosses the cheek, over the masseter muscle, to perforate the buccinator and terminate in the mouth, opposite the space between the second and third mo-

lar teeth of the upper jaw. The result of this is that the saliva is discharged upon the cheek, or a salivary fistula, in other words, is established, which will not heal until the current of that fluid is diverted from it. A recent incision into this duct should be coaptated nicely, and will sometimes adhere. When fistula is actually formed, we are to take a very delicate trocar with its canula, and having introduced two fingers of the left hand into the mouth, and made tense the inner surface of the cheek, to pass the trocar through the external orifice into the buccal cavity. We then withdraw the stylet, and pass a wire or silk thread into the end of the canula which is in the mouth, bring it out on the cheek, withdraw the tube, and tie the ends; an operation very analogous to that for puncturing the lobe of the ear, described at p. 235. When the passage has become pervious throughout, the seton is withdrawn, and the opening on the cheek healed by the repeated application of lunar caustic.

3d. *Wounds of the Throat.* These are commonly incised, punctured, contused, or lacerated. The existence in this part, of the trachea, œsophagus, carotid arteries, par vagum, and internal jugular veins, make wounds of the throat or neck dangerous, and often fatal. If the trachea be divided, adhesion is to be attempted by a proper position of the head, sutures through the integuments, and adhesive strips. It will not, probably, unite by the first intention. Swallowing is not to be allowed for obvious reasons, and a gum-elastic catheter, through the nose, is to be used for introducing food into the stomach. The œsophagus lies too deep to be often wounded, or to be treated if it were. Here, again, nasal catheterism is to be practised, with a view to attempt to procure an adhesion of the wound by repose of the part.

The *carotid* arteries are, from their anatomical situation, more likely to be opened by wounds of the lower parts of the neck, and hence often escape in attempts at suicide, because, the head being thrown back to effect the incision, the throat is cut too high up, and near the chin. Incised wounds of these vessels will generally prove fatal at once; lacerated wounds, as they do not bleed freely, may give time for ligature; and punctured wounds, from the smallness of the opening, may not admit of any rapid escape of blood; however, if there is time, the artery must, in any event, be secured. The *thyroideal* arteries, when divided, will afford fatal hæmorrhage, which may be mistaken for that from the carotids themselves. The *lingual* arteries also bleed freely, and must be taken up and tied. (See Hæmorrhage, p. 372.) The *internal jugular* vein, if largely wounded, will be productive of fatal consequences; and in all cases, its injury is highly dangerous. That of the *par vagum*, though perhaps not certainly, is almost inevitably fatal. The bleeding being checked, the integuments are brought together by suture and plasters. If the *tongue* is wounded, the œsophageal tube will be attended with happy results; and the outer wound will probably become fistulous from the issuing of the saliva, which much impedes its union.

4th. *Wounds of the Chest.* Wounds of the thorax are highly interesting, both from the symptoms with which they are necessarily attended, and those to which they subsequently give rise; viz. emphysema, empyema, extravasation of blood, fracture and caries of the ribs, suppuration of the lungs, hectic, &c. Wounds of all kinds are here inflicted; but stabs, cuts and gun-shot injuries are perhaps the most frequent. When the character of the membrane which lines the chest, and the important parts which it contains, the lungs, the heart, the great vessels, and the thoracic duct are remembered, it may readily be conceived that the prognosis of these injuries, when deep, is unfavourable. Yet do the most desperate injuries of the lungs sometimes get well, and those of the heart itself have been survived for days.

A wound of the *pleura* is always serious, however small, and demands the strictest depletion. Wounds of the *heart*, aorta, pulmonary arteries, &c. are never recovered from; unless, perhaps, that of the former organ be very narrow and unextensive, or its fleshy part alone be injured. If the *lungs* are badly wounded, the bleeding may at once be fatal. If this danger is escaped, we find the patient livid, pale, restless and in great anguish; his respiration difficult, with bloody expectoration. He is then in danger of suffocation from the internal bleeding. Free and repeated *venæsection* alone can save him, and check the subsequent vascular excitement in the organs. The effused blood must be evacuated by the finger, or a canula, passed in at the wound. Splinters of bone, the ball, cloth, &c. are next to be, if possible, removed, and then the strictest antiphlogistic treatment is to be persevered in, until suppuration comes on, when tonics and a good diet will be required to sustain the strength.

5th. *Wounds of the Abdomen.* These, from the tendency which the peritoneum has to inflame, are too often fatal wounds. No part of the body is more exposed to injury than the belly, and, unlike other cavities, it is not provided with a bony casing for its defence. To every kind of wound then, it is very liable, and they are very serious. Besides peritonitis, which, when traumatic, is almost always fatal, fœcal, urinal, biliary and sanguineous extravasations occur within that membrane when the viscera are wounded, and inflame it.

Punctures and incisions of the walls of the belly which do not penetrate it, heal easily by the use of plasters, or if necessary, sutures; their edges being first cleansed. Position here aids much in the adhesion; and graduated compresses and the body bandage are required. There is, ever afterwards, a disposition to hernial protrusion. Some of the arteries hereabouts are liable to be cut: the epigas-

tric, circumflexa ilii, the internal mammary, &c. The first might give rise to terrible hæmorrhage. The cellular tissue of the abdomen sometimes becomes extensively infiltrated with blood, and so does also that of the scrotum and groin. This ought to be punctured and discharged, for fear of suppuration and its results.

Contused and lacerated wounds are more serious in their consequences; suppurative and irritative fever without, and peritonitis within, frequently following them. The same treatment, with increased depletion, is therefore called for.

Penetrating wounds of the abdomen are dangerous, in proportion to the injury they inflict on its contents; but it is a source of much consolation to observe that balls, swords, &c. will very often pass into the cavity of the belly, and yet, in a wonderful manner, avoid wounding the parts within it. When the *peritoneum* has been extensively opened, the intestines generally protrude; either loosely, or strangulated by the lips of the wound. In the first event, they are to be washed in tepid water and returned; that portion being always put back first, which issued last, and giving to intestine the preference over omentum, if that have issued also. We then pass in the finger, make a circular sweep around the orifice, to be sure that none remain behind; and afterwards unite the outer wound in the usual way. It may not be practicable to put back the bowels, because of the smallness of the opening, the tumefaction of its edges, the distension of the gut, spasm of the muscles, &c. The finger or a director should, in the first event, be passed in at the upper angle of the wound, and the latter, be dilated upon it, parallel to the direction of the muscular fibres, with a probe pointed, straight or concave bistoury. Muscular spasm is to be controlled by bleeding and opium. There is always great danger that the inflammation of the external wound will extend to the peritoneum within, after some time. *Intestines* are often wounded. Owing to the great rapidity with which they contract adhesions to the peritoneum, and to the constant and uniform pressure of the bowels to that organ, and to each other, they are rendered less dangerous than they otherwise would be, and are also less likely to effuse their contents. Hence these cases are known to recover without accident, although several convolutions were wounded. To a wounded intestine within the body, nothing can be done. If it protrude, and be at hand, as many stitches as are necessary may be made between its cut edges with fine silk, the ends cut off, and the gut returned. It will thus often do well. In this, as in every case of abdominal lesion, bleeding, fomentations, enemata, rest, and the lowest diet must be used and observed. Abdominal wounds which seem doing well, may ultimately prove fatal by the occurrence of sloughs within, and effusion into the cavity of the belly. Wounds of the liver and spleen are almost always quickly mortal. Wounds of the stomach may be recovered from, by the adhesion of this viscus to the wound, and a fistulous external orifice remains, communicating with its cavity. Of this, a most interesting instance occurred to Dr. W. Beaumont, U. S. A., in the person of a man who, having been wounded in the side, recovered with the existence of the fistula here mentioned. The details of this case, with the experiments and observations upon the gastric juice and digestion, which it enabled Dr. B. to make, will soon be laid before the profession, and promise to afford the highest interest. When the bladder is wounded by contusions, gun-shot and other wounds, fatal extravasation of urine often occurs into the belly. But wounds of this organ, although dreadful and highly dangerous, sometimes are recovered from, when, owing to the wound having occurred in that part of the fundus which is uncovered by peritoneum, from some peculiarity in the condition of the bladder at the time of its reception, &c., the abdominal cavity proper has not been entered by the wounding instrument. Urine always issues by the wound, and when this is seen, the introduction of a catheter is the very first thing to be done. A wound of the gravid uterus would necessarily give rise to abortion, and probably to peritonitis and death.

Wounds of the *large vessels* within the abdomen must be imminently dangerous, and with few rare exceptions, are always fatal. In the case, however, which occurred to Prof. Gibson, of Phila. the common Iliac artery, next in size to the aorta itself, was torn across by a musket shot, and yet the bleeding did not at once prove mortal. The professor, chancing to stand by when the wound was received, instantly thrust his hand into the bleeding orifice, and compressed the vessel whilst the patient was carried home. When there, the artery was detached, exposed, and tied. Moreover, two convolutions of intestines having been wounded, were sewed up as we have above described. The artery never adhered, but sloughed from the contusion on the 9th day.—On the 13th, the patient died. Whether the sutures had caused an adhesion of the cut edges of the intestines is not stated, but general inflammation extended over the whole mass of the bowels. (*Inst. and Prac. Surg.* Phila. 1827.)

The treatment here adopted, would of course be proper in any other cases in which the same steps were practicable. The bones of the pelvis may be wounded or fractured; they will then exfoliate, and their fragments, as well as balls, splinters, cloth, &c., give rise to wasting fistulæ and suppuration. An injury of the vertebræ will sometimes cause psoas abscess.

6th. *Wounds of the Limbs.* So much has already been said incidentally, in different parts of this work, upon this subject, and the effects of injury in these, are so similar to those in other parts, that our notice must necessarily be very brief. They are liable to injuries of all kinds. Fractures of the bones, wounds of nerves, tetanus, hæmorrhage, neuralgia necrosis from injury done to the periosteum and medul-

lary part of the bone, with its consequent exfoliation; anchylosis of joints, loss of power and sensation, sinuses, fistulæ, and adhesions from cicatrices, result from them. Amputation is often demanded either primarily, or as a consequence of their effects. Where bones are broken, integuments ploughed up, and the main artery bruised or torn, the operation is generally called for. Wounds of joints which open the capsular ligament, *however trifling in extent*, give rise to high inflammation, and are often fatal. Violent fever, inflammation and death, very frequently ensue. If not, abscesses, ulceration, caries of the bones, and wasting hectic supervene, of which life or limb must pay the forfeit. Sometimes the patient recovers with anchylosis, and a stiff joint. In the examination of such wounds, great gentleness must be used, and every means be employed to prevent the consequences; to do which is easier than to cure them. The wound, if simple, should be closed with plaster; and the joint be freely leeched, blistered and poulticed, or cold lotions must be applied. Entire rest, and an elevated position of the limb, will aid in lessening the inflammation. If suppuration does come on, the constitutional strength must be supported. The co-existence of a wound and a fracture, constitutes a *compound* fracture, which is always a very dangerous accident. *From punctured* wounds of the limbs, arise tetanus, collections of matter beneath the fasciæ, with their terrible consequences, abscesses of the lymphatic ganglia, &c. In all such cases, the wound must be dilated, the fascia transversely incised, and poultices applied. The urgent symptoms then soon cease, and healthy pus is discharged.

Contused Wounds, here and elsewhere, often do much internal mischief, even though the skin be not broken. Bones may be fractured extensively, arteries ruptured, and blood be effused into the cellular tissue, of which events, gangrene is an almost certain consequence. Cloths dipped in cold water, leeching, and general bleeding, with rest, ought at first to be directed, to lessen the inflammation which follows the accident, and which produces a mortification yet more dangerous, than that which results directly from the impaired organization of the parts. Two or three days are long enough to use them. When the sloughs, separate and granulations begin to form, they must be treated in the usual way. The wound should be brought gently together without force or pressure, and the tendency to gangrene is ever to be borne in mind. (*J. Bell on Wounds. Cooper's and Gibson's Surgery. Cooper's Surg. Dict. the Dict. de Med. and the Dict. de Med. et Chir. Pratique.*)

This brief detail on the important subject of Wounds is confessedly imperfect. Indeed, when it is considered how extensive is the subject, and how limited our space and scope, we believe it will be conceded that more could not have here been said. We have endeavoured only to supply some important data, as a foundation for more accurate knowledge.

For the manner of dressing wounds, in the various ways advised in particular cases, the reader should refer to pages 18, 26, 294. The method of securing bleeding vessels, is fully described at p. 372 on Hæmorhage; as well as in the note on that subject, in this Appendix.

ON GUN-SHOT WOUNDS.

Note XVIII. p. 312.

The author having declined any notice of gun-shot wounds, we have attempted, in this brief manner, to remedy the deficiency. These missiles give rise to a mixed class of injuries; they penetrate, they lacerate, and they contuse. The ball first contuses the part on which it strikes, then tears its way through it, lacerating muscle and artery and splintering bone, until either its career is arrested, or it passes out at a counter opening, at a greater or less distance from that by which it entered. The opening is small, and generally sphacelates. When the sloughs come away, which they do from the fifth to the twelfth day, the eschar may involve some large vessel, *and a profuse and very often fatal hæmorrhage* may follow its detachment. Gun-shot wounds always suppurate, the inflammation sometimes running very high. Buttons, keys, pieces of cloth, &c. are very often carried in with the ball, which greatly aggravate the discharge, and must be removed before the wound will heal. It is a common thing, when a gun-shot wound is received, for the individual to be seized with unaccountable fear and trembling, and this occurs alike to the strong and the weak, the dastardly and the courageous. This circumstance, however, is by no means invariable.

It has been asserted that persons were killed by *the wind* of a ball as it passed them. This is now universally denied, and in every case of death from the discharge of a fire arm, without the appearance of external injury, the ball may be supposed to have struck obliquely, and the contusion to have proved fatal by the infliction of some inward lesion, which, as has been before stated, often occurs in the abdomen and head.

The treatment. The seat of the injury will very much determine the treatment required; and that for those of the head, belly, and chest, has already been given. In wounds of the limbs, an accurate examination is proper. When the finger can enter, it is the best probe, but it must be used with great gentleness. If it is not applicable, a bougie, or a catheter, or else a gun-shot probe must be employed. No time should be lost in making the search, for when the wound inflames and tumefies, it becomes painful or impracticable. We are enabled by it to discover the track of the ball, and perhaps to feel it; to ascertain if the bone or artery be injured, or if amputation seem required. If we can perceive the ball, or a splinter, clot or other foreign body, we are to remove it at once with proper forceps, of

which there are several kinds. On the other hand, if the ball be lodged near the outer surface of the limb or trunk, it may be removed by a counter incision over it. If it appear that *safe* dilation of the wound would aid in extracting it, it may, according to Mr. J. Bell, be performed. We are by no means always to expect to discover balls near the seat of their entrance; they often lodge a great way from it. They are easily turned aside by very slight resistance, and will run along a continued surface to an extraordinary distance. "A ball struck the *breast* of a man standing erect in the ranks and was found in the *scrotum*."—(*Hennen.*) A ball, likewise, sometimes work its way along through the cellular tissue, and appears outwardly, exciting during its passage, pain and suppuration. Again, balls will lie buried in the body, enclosed in cysts, for years, and perhaps for life, and give no evidence of their existence by causing any mischief. An interesting case of this kind came under our own notice. A Mr. K. who had engaged in foreign service in South America, received a musket ball in the right eye, which passing through that organ, and the side of the nose, divided the recti muscles of the left eye, upper or lower, we forget which, so that the ball of that eye, though sound, could not be moved, and the patient was therefore totally blind. He soon returned to New York, where, after living for some years, he died of an hypertrophy of the heart. His own impression was that the ball had fallen into his mouth, and that he had thence discharged it. It occurred to our friend, Dr. A. F. Vaché, who examined the body, to see whereabouts it really had lodged: and, in the posterior part of the left orbit, somewhat flattened, lay the bullet in the state in which it had entered. Too much injury, then, should not be inflicted to extract them. This having been either done, or abandoned, we are advised by some to poultice the wound, and by others to apply cold water, until healthy pus exudes; after which, mild and unirritating dressings are proper. Inflammation and irritation may at first call for depletion; but, after suppuration forms, generous diet and tonics may be required to support the strength. If the wound remain fistulous, some extraneous body is probably present, and now, loosened by the fluids of the sinus, may more easily be removed. It may protract a cure for months, and even years, and give rise to hectic, abscess, and emaciation. If such be the direction of the ball, that the artery of the limb may be presumed to be endangered, every attention must be paid to the moment when the sloughs separate, and a tourniquet should be worn loosely around the limb, and screwed up on the appearance of the least bleeding. The vessel must then be taken up. Diffused aneurism, or even immediate death, may in this way ensue. Repeated hæmorrhages, with comminution of bone, injury of both artery and vein, large contusions or lacerations of muscles, &c., in which cases mortification is certain, torn wounds of joints with fracture, compound fractures from gun-shot wounds,—all call for the early performance of amputation; nor are the cases rare in which it is consecutively demanded.

POISONED WOUNDS.—(*Erythema Anatomicum.*—Good.)

Note XIX, p. 317.

The subject of wounds received in dissection, has now acquired a painful interest from the number of the victims to anatomical investigations. The work on Constitutional Irritation, by Mr. Travers, contains the fatal cases of Drs. Pett and Bell, Prof. Dease, Mr. Newby, of five medical students, and of an undertaker; besides several in which ultimate recovery took place, after tedious and dreadful suffering. Mr. W. Hewson, the distinguished anatomist, Prof. Le Clerc, a son of Dr. Darwin's, Mr. Shekelton, of Dublin, Dr. Cumming, of Edinburgh, and very recently Dr. Darwall, of Birmingham, England, are to be added to the list of those who have perished; and the fate of the lamented Mr. Adrian A. Kissam, in our own city, who died in six days from a trifling incision inflicted whilst dissecting, is fresh in the recollection of his friends and of the profession. (See *Am. Jour. Med. Sciences* for Feb. 1828: the case is there reported by Dr. Godman.) It is yet a disputed point whether absorption of *a poison* really occurs, or whether some state of system, such as fever, some excess in wine, &c., in other words, some exciting cause, has not existed, which has called up the trifling irritation into a morbid action. Such a state of system doubtless, in many cases, pre-exists and may aggravate slight injuries: those even, to which no suspicion of poison could attach; but this is not sufficient to invalidate the contrary opinion. It does not appear that putrid animal matter is more active in the production of the morbid symptoms from wounds received in dissection, than that which is fresh; putridity, on the contrary, has been thought to lessen their effects; and cuts, as well as punctures give rise to them. The virus equally pervades all the fluids of the dissected body; and is not influenced by the disease which had destroyed it. The symptoms generally appear after a lapse of about 24 hours from the receipt of the injury; sometimes, however, they occur directly, and at others are protracted for four or five days. Pain is not always felt in the wound, nor are the absorbents always inflamed, nor the axillary glands tumefied; but the constitutional symptoms appear *previous to the local ones.* In the case of Mr. Dease, it was only by analogical inference, on the evening of the third day from the attack, that the origin of the disease was traced to its real cause; nor was the source of mischief presumed by others, admitted by himself. Against this insidious introduction of the poison, every dissector should be on his guard; and pay *instant* attention to a wound *however trifling.*

The fatal termination of these injuries is variously protracted: patients have died in forty hours, and others have lingered for two and twenty days; those who have recovered, have continued for months in the most reduced condition, from the profuse suppuration, and some have not for years regained the use of the arm. The consequences of a dissecting wound, may be: 1st, thecal and fascial inflammation of the arm: swelling and redness of the absorbents, suppuration, and consequent irritative fever. 2d, the most common form in which it appears, is in what is called diffuse cellular inflammation. The absorbents are not always inflamed. The glands of the axilla are painful and enlarged, and there is diffused swelling, with redness, up along the neck, and downward upon the side. It does not pit on pressure, but has an obscure sense of fluctuation. At length, matter forms, and is copiously discharged through the artificial opening, accompanied with large flakes of disorganized cellular tissue; this inflammation often ends fatally by gangrene. A bold inflammation of the absorbents, axillary glands, and cellular membrane, is much less dangerous than that which first manifests itself upon the general system, without local evidence of the affection. In these cases, which constitute the *third* form, excessive pain about the shoulders, *with fulness of the neck and breast, and axilla*, which is particularly a diagnostic sign, together with high irritative or typhus fever, excessive pain in the head, nausea, and vomiting, fierce delirium, coma, hiccup, tympanites, &c., occur, and are seldom recovered from.

Treatment. Upon the Continent, the little wound, the moment that it is discovered, is washed, allowed to bleed freely, and then cauterized with potash, nitrate of silver, the butter of antimony, the liquid muriate of ammonia, &c. The patient is directed to live low, and to pay proper attention to the state of the bowels. In England, the wound is freely divided by a sharp lancet, and poultices are applied. The lymphatic inflammation is treated with lead water and laudanum, in the usual way; and calomel and opium is to be taken freely as a purgative. With regard to the constitutional treatment, there is a difference of opinion. Some rely upon depletion, and others advise the free use of wine, porter, and other stimulants. When matter is formed in the finger, it should forthwith be opened. No one should persevere fool-hardily in dissecting, who has cut or chapped fingers, or who has wounded himself in the process. In the latter case, the hands should immediately be washed, and *the wound sucked for at least a quarter of an hour*, without intermission, when it should be covered with court plaster. Such was the advice of Dr. Godman, in his dissecting room; and, *if done thoroughly and at once*, will generally suffice. Should constitutional symptoms appear, medical aid should at once be resorted to, and the remedies which are found to be of use in analogous affections from other causes, be assiduously urged; for, it must be remembered, that from this disease, few, even the most robust, escape with life.

POISONED WOUNDS.—*The bites of Serpents.*

Page 319.

We do not find that the common viper (*coluber berus*), is a native of this country, and shall therefore add nothing to the observations which are so full in the text. The bite of this animal is far from being always fatal, although it has undoubtedly proved occasionally so; but the majority of cases, however alarming, would probably have spontaneously recovered; and therefore it may be supposed that various remedies have obtained credit for effecting recoveries which nature herself would have brought about. "In vain," says a French writer, "has Fontana, the cleverest of experimenters, and the most logical of toxoicologists, endeavoured to prove that the bite of the viper, and indeed of most venomous reptiles, seldom causes death; the opinion still remains, that the eau-de-luce and ammonia, preserve the lives of the few to whom they are administered. We have never seen the internal use of the latter medicine modify these injuries in the least, and we think, with Fontana, that it is hurtful, or, at least, useless.—(*Trousseau, Dict. de Méd.*; Art. Ammonia.)

Another species of this genus of serpent (the *coluber aquaticus*), is said to be a native of Carolina, to resemble the rattle-snake very much, and its bite to be almost as mortal. A third, also (*coluber cacodæmon*) is likewise of a venomous character, and said to be a reptile of this country. Two other venomous serpents are met with, in America; the rattle-snake (*crotalus*), and the copper head (*boa crotaloides*). Of the former, several species are known, of which the horridus, durissus, dryinas, and miliarius, which latter has no rattle, are the most malignant. The rattle-snake possesses the power of secreting the most deadly poison of any of the serpent tribe; yet is it furnished, as if by a peculiar institution of Providence, with an instrument capable of warning mankind of the danger of too near an approach: this it always sounds when provoked, or alarmed, and before it inflicts its bite. It is a curious circumstance, that although serpents generally possess an immunity from the bites of one another, that of the rattle snake is fatal to every other, and even to itself. The animal is viviparous, slow, and inactive; from three to four, and sometimes even eight feet long. The arrangement of its poison fangs, is similar to that of the viper described in the text. The *crepitaculum* occurs as an appendix to the tail, and is moulded upon the last vertebra. It forms in successive cups, each having ridges externally, and grooves internally. When the first has arrived at maturity, the second begins to form underneath, and pushes off the first from the vertebra. The number is generally 12, but as many as 20, or 30, are

said to have been met with. As each cup forms within the groove of the preceding one, a kind of ball and socket joint is effected at each division, admitting of an imperfect degree of motion when the body moves. The cups, as they are successively pushed from off the vertebra, dry and become brittle and elastic. It is the motion of each dried cup upon the other, as the serpent moves, that makes a noise not unlike the rattling of dried parchment, which may be heard at a distance of twenty yards. In wet weather, the rattle is soft and mute.

The bite of the crotalus, with that of the coluber carinatus of the West Indies, and of the cobra di capello, or coluber naja, of the East Indies, is the most speedily fatal of any of the serpent tribe. The copper-head of this country (*boa crotaloides*,) is, however, scarcely less malignant. The severity of the symptoms depends upon the intensity of the poison, which, in turn, is influenced by the season (being most active in summer), by the degree to which the animal is irritated, its size, strength, &c. To this may be added, the greater facility for absorption afforded by the situation, depth, &c. of the wound. The symptoms of a wound caused by poison of less intensity are, delirium, great pain, serous effusion about the injury, which is cold; feeble pulse; constant nausea and vomiting, which render it difficult for the medicines that are given, to be retained. In about sixty hours, these subside: inflammation and suppuration set in, and if the abscess be very large, it may prove fatal. The bitten part may also sphacelate.

When the poison is more active, the local wound generally affects the system suddenly and violently, and death soon occurs. Utter torpor and unconsciousness have followed the bite of the snakes of the West Indies, in ten minutes from its infliction.

The plan of treatment laid down by the author is full, and sanctioned by the highest authorities. We are informed, upon undoubted testimony, that when the Indians, or traders among them, in the north-west regions of our country, are bitten in their excursions, which is not uncommon, they employ the ligature, scarify the part with a knife or flint, rub some gunpowder into the wound, and make a conical mass of the same material moistened over the seat of injury. To this they set fire, and after undergoing this *moxa* are seldom affected with unpleasant symptoms.

The case of Soper, reported by Sir E. Home, is briefly copied in *Good's Study of Medicine*, vol. ii. p. 273; and an interesting one, with the *post mortem* examination, of a man named Lake, who was also fatally bitten by a rattle snake, is contained in the *Am. J. Med. Sciences*, for August, 1831, reported by Prof. W. E. Horner, of the Penn. University.

OF POISONED WOUNDS.—*Hydrophobia.*

Page 324.

Although known from early ages, this horrible disease has thus far resisted every attempt made to investigate its pathology. The improvements in anatomical science, so conspicuous in the light which has been shed over almost every other malady to which flesh is heir, have failed to illuminate the obscurity that hangs over this affection: perhaps the only one which nature never cures, and which art can never either palliate or overcome.

As it originates spontaneously in animals, and may be conveyed from the one to the other, so also it occurs without known cause in the human subject: but is generally the result of a wound received from a rabid animal. It is satisfactorily ascertained that between human beings, it is not communicable. But whether animals are capable of being infected with it by the saliva of a human being labouring under rabies, although generally disbelieved, is by one statement rendered undecided. It is asserted, as worthy of credit, that on the 1[illegible]th of June, 1813, Magendie and Breschet took upon a rag some of the saliva from a man who soon after died, and inoculated with it two healthy dogs; that on the 27th of July, one of them became rabid, and bit two others, one of which latter also became rabid. (Cooper's Dict. quoted from Busmou.) As, however, five weeks elapsed previous to the dog taking the malady, and as he sickened late in the month of July, at which season of the year spontaneous rabies might have occurred naturally, the event may be mere coincidence, and not cause and effect.

The popular notion that no mad dog can lap water, is now proved to be erroneous in many instances, and ought never to influence the judgment where other suspicious circumstances exist. It likewise deserves to be borne in mind, that not fury, but *depression and irritability*, are the characteristics of the rabid state. It should also be remembered that dogs have infected human beings at a time when they were not supposed to be mad, and that the mere licking of an abraded part has produced it. Of a number of persons who are bitten by a rabid animal, only a certain, and a small proportion, contract the disease; and wounds, in which the teeth first pass through the clothes and are thereby partially cleansed, are less dangerous than those inflicted upon the naked skin of the hand and face. The earliest authenticated period at which hydrophobia has appeared after the injury, is *eleven days*. Dr. Bardsley, of Manchester, has recorded a case, in which the most careful inquiries tended to prove that the patient had sustained no injury subsequent to a bite *twelve years previous*, by a dog seemingly mad. It is very certain that the mind exercises over the body a most powerful influence, and in no disease is that fact more clearly evinced, than in this. Although instances are not wanting of

persons, who, during the attack even, upon being interrogated, denied the receipt of a bite, in whom it had however actually occurred, there is reason to believe that fear has, of itself, kindled up the malady, and must greatly predispose to its occurrence. Every one, therefore, to whom the accident happens, should instantly resort to the prophylactic measures laid down by the author, on page 324; and also upon the subject of cauterization, at page 148; after which, the condition of the animal by which he has been bitten should be inquired into. If, which will often happen, the dog, or whatever it be, prove afterwards not to have been rabid, the mind will be set at ease. On the other hand, although the worst is known, that knowledge cannot be more painful than the previous suspense; and the patient will then have the satisfaction of reflecting that, at least, those measures have been adopted, which will, in most, if not in every instance, ensure protection.

The distress upon swallowing, or upon the sight of liquids, is unquestionably the most remarkable symptom of the disorder, and, to a degree more or less extensive it is believed *never* to be wanting. In many, like effects are produced by blasts of air, however slight; by strong lights, or the glitter of any shining substance, and a looking-glass in particular. The buzzing, or passing of a fly; the sound, nay, the mere mention of fluids; the touching of the hair, &c., are sufficient, in some cases, to create paroxysms of a convulsive kind. But, in different individuals, some or other characteristics are wanting, or less prominent. The mind is generally rational to the last; the physical strength is unimpaired; and thus far, the nature of the poison and of its effects, as well as the immediate cause of death from this complication of terrors, lies hid in obscurity.

Upon the prophylactic measure of cauterizing, either actually or potentially, the author has been sufficiently minute. The patient should forthwith wash and suck the wound, if accessible to the mouth; and then resort either to the *red hot iron*, or to *excision* by the knife. The part should be completely *cut out*, even after a lapse of weeks from the accident; and, by English surgeons, this is preferred to caustics. It removes, say they, at once the part and the poison. Amputation, even, is advised, when the nature or depth of the wound precludes the chance of excising it by the one, or of destroying it by the other method. To the wound made in the excision, cups may be applied, as Dr. Barry has advised us, on page 187. These means, as preventives, with the injection into the veins during the disease, and bleeding *ad deliquium* as was practised by Mr. Tymon, constitute all that art can do, in warding off, or in combating this fearful malady. To enable the reader to judge of its nature for himself, the following case is subjoined, as one of the most striking illustrations of the disease, that has lately been made public:

Dr. Elliotson's case. A boy named W. Charles, ætat. 16, was brought into St. Thomas' Hospital, in May. Upon the Doctor attempting to uncover his face as he lay in bed, he suddenly fetched a deep breath, then seemed half choked, and half a dozen such sobs occurred in rapid succession, his countenance expressing extreme distress. Dr. E. then took hold of his hand beneath the bed clothes, to feel his pulse, and in so doing, as a wave of air was necessarily induced upon his face by the motion, the same occurrence took place. Again, upon Dr. E. holding his hand, with the fingers down, over his face, and bending them towards the palm of his hand, the arm and rest of the hand being kept perfectly still, sufficient agitation of air was produced to make him open his eyes, take a sudden inspiration, feel choked, and experience such a succession of convulsive sobs as induced him piteously to intreat that the wind might not be drawn on him in that way The agitation of the air produced by Dr. Root's pulling out his snuff-box, was attended by a similar effect, and as it occurred soon after his entrance into the hospital, led to a suspicion of the nature of the case. A looking-glass was now sent for, and the reflection of the light cast from it produced the catching of his breath. He gazed at it intently for a few seconds, hid his face with his hands, and desired that it might be withdrawn. Milk produced a like result. The boy himself *denied* having been bitten by any thing whatever; though the probable cause was traced, afterwards, to an injury from a dog in the December previous. Dr. Root having decided on treating the case with the *super acetate of lead*, which had been favourably spoken of, and not repeatedly tried, some of it was dissolved in water, and offered him in a tea spoon; he absolutely refused to swallow it, declaring that he could not; and became so much agitated as to have a return of the sobs and forced inspirations. The *guaco* juice was now, however, substituted for the lead, in the further treatment of the case. When let alone, the boy lay quiet, occasionally catching his breath; pupils dilated; pulse 80 to 96; heat natural; face flushed. At half past four, two ounces of guaco juice were injected per anum. It seemed to tranquillize him, and he slumbered unsoundly for some time. He was disturbed by the slightest noise, and each return to consciousness was followed by sobbing, pain in the throat, &c. He started from the recumbent posture, wrapped his blanket round him to exclude the air, and with the most agonizing expression of countenance, struggled convulsively for breath. At half past eight, a lighted candle was brought into the room, and excited him in a frightful degree. The instant the first ray reached him, he sprang convulsively from his bed, and exhibited his usual fit. The secretion of saliva now became abundant, and he spat about without reserve.

When it became necessary to give him his medicine, and this was told him, he was supported by an assistant behind, and another held the liquid in a small bottle before him. The anticipation produced a spasm: after an effort he would dart with

phrenzy at the bottle, swallow the contents, and fall back in violent spasms. Friday, 2 o'clock.—Whilst he was supposed to be sleeping, a glass of water was brought into the room for one of the attendants, and placed upon a chest of drawers; but no sooner was it put there, than the wretched patient was heard to labour to suppress the rising convulsion, till, unable longer to restrain himself, he sprang as usual from his bed, and after an agonizing struggle for breath, shouted, as soon as he had obtained it, "The water,—away with it!" At eight o'clock, he used the chamber-vessel *without distress*, neither the sight or sound of urine disturbing him; pulse, 130—140. At half-past eight, a candle was again brought, and again it convulsed him. At 10 o'clock, great irritability of temper; spits incessantly; nausea and flatus. Saturday morning, one o'clock.—He spits in every direction, and shortly after became excessively violent, though he requested to be secured. He now began to call voraciously for food and drink, which he consumed freely, and without difficulty; his mind in a state of ungovernable fury. At a quarter after three, the face was livid and congested; temporal arteries felt with difficulty. Two drops of hydrocyanic acid and some guaco were given him; he just swallowed them, and expired.

The difficulty of swallowing, not only liquids, but solids; the *pathognomonic* effect on the diaphragm and muscles of the throat by the access of air, of fluids, or the slightest touch, viz. the catching of the breath, are, in this interesting case, remarkably evinced. The morbid irritability attendant on the disease, the rage, anguish, alarm, and suspicion so manifest in its progress, were here also painfully apparent. The suddenness of the death is also frequent; and this patient died about the usual time, although the fatal issue has been protracted until the seventh day. Indeed, it is scarcely possible to meet with an illustration more striking of the malady, than this example the leading points of which we have now briefly detailed.—*Lancet, Vol. II. May*, 1829.

TRANSFUSION.

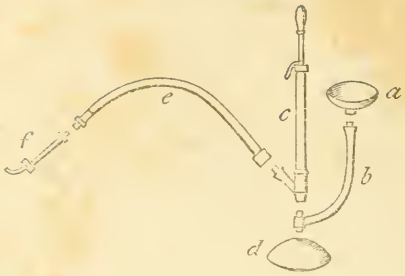
Note XX, p. 325.

The importance which has of late been attached to this operation, and the essential services which it has already rendered in the treatment of diseases, have induced us here to introduce some remarks upon the manner of its performance. It is now ascertained, that not only can water, pure or containing saline, or other matters, in solution, be injected into the veins of the living human being, but that under certain circumstances, the injection of *healthy uncoagulated human blood* is attended with the most beneficial results. The blood of no other genus of animal can, it is found, be injected into human veins, but that of man himself, with impunity. It is not alone in Hydrophobia that transfusion has controlled the violence of spasm; we find that Tetanus has been cured by M. M. Laurent, and Percy, by the injection of a decoction of stramonium, and by Dr. Coindet, by that of a solution of opium. One use, therefore, to which it is applicable, is the administration of remedies by the veins. 2d. Its most important application is that, in which it is employed for injecting human blood into the living subject, for the purpose of recruiting a system exhausted by profuse or long continued hæmorrhage. 3dly, a more recent, and very valuable use has been made of this method, in cases of the malignant or spasmodic cholera, which, in 1832, extended its ravages over England, Europe, and our own continent. We mean that of conveying into the veins, solutions of saline materials, to supply the deficiency of them known to exist in the blood in that fatal malady. The first case of transfusion in the stage of collapse, was performed by Dr. Latta, of Leith, Scotland, in May, 1832; and being repeated by Drs. Craigie, M'Intosh and others, in many instances with unhoped-for success, it speedily spread to other countries, and now ranks among the most prominent of all our remedies in that state of prostration. (*See Lancet, June*, 1832.)

It is not occasional instances of success, in an occasional epedemic, however, which claim for transfusion our admiration, or command our attention. It is in that alarming state of exhaustion, to which the female is reduced by profuse hæmorrhage during gestation, or after delivery, that its happiest effects have been obtained. The transfusion into the veins, under these circumstances, of a few ounces of human blood, gives light to the eye and colour to the cheek in a shorter time than any other stimulant with which we are acquainted, and when every thing else is unavailing. This practice, for which we are mainly indebted to Dr. Blundell, of London, has of late years, in his and other hands, been very often attended with the best results.

The instruments with which this interesting operation is to be performed are numerous. Most of the patent syringes are now provided with the pipe, &c. necessary for this purpose; but two have been constructed specially for the purpose.

The first instrument is that invented by Dr. Blundell, for the transfusion *of blood*, which is better adapted to that delicate purpose than any other. It consists of a brass syringe, capable of holding two ounces, tinned inside, and air tight; to this is affixed a long tubule, bevilled like the spout of a tea-pot. The second is Read's patent apparatus, which is represented in the annexed figure; it is used for the transfusion of either fluid; and consists of a cup (*a*) to receive the fluid which is to be injected, as it flows from the orifice in the vein of the person who is to furnish it; of a tube (*b*) from which it is to be drawn into the syringe (*c*); of a pedestal, (*d*,) upon which the apparatus is supported; of a gum elastic tube (*e*), which conducts the fluid from the syringe to the silver pipe (*f*), which is inserted into the vein.



We shall now proceed to describe the process of the transfusion *of blood*, by the syringe and tubule. There are required for this operation a tumbler, or a saucer, to receive the blood drawn from the arm of a by-stander or two, by whom it is to be furnished. The right arm of the patient being suitably held, the surgeon lays bare a vein in it with a scalpel, at one cut. So little pain does this give, that the person, generally, is not aware even that it has been done. Underneath the vein, a short curved probe is to be passed, over which, with a lancet, an incision, an eighth of an inch long is to be made in the vessel, whence, perhaps, a little blood may ooze. The operator then inserts the tubule, to be certain that it will afterwards enter easily. This being done, he proceeds in the usual way to detract blood from the person who is to supply it, and does so from rather a large orifice. The blood is received into the tumbler, whence it is immediately absorbed into the syringe, in such a manner as that very little shall ever have time to accumulate in the vessel in which it is caught; no coagulation should ensue, and the arm should yield the blood in a full stream. The syringe being filled, and the supply from the arm stopped by pressure, the operator, holding the instrument vertically, the nozzle upwards, and the handle downward, *presses upon the piston until all the air, and some blood has been discharged.* The entrance of a single bubble of air into the vein, though not necessarily fatal, is much to be deprecated. Then he closes the nozzle with his forefinger, touches the orifice in the vein with a sponge, passes in the tubule for half an inch in its cardiac direction, and then, without trepidation, but with calmness, both mental and corporeal, proceeds to deliver the blood; not too quickly, but with moderate haste. During this time, he is carefully to watch the countenance of his patient; if the lips quiver, if restlessness, or vomiting come on, he is to suspend the operation. If all goes well, he washes his syringe in tepid water; waits for six, eight, or ten minutes; procures a *new supply* of blood, —charges the syringe, and injects it as before. Sometimes, four or five ounces are sufficient; eight or ten is a moderate transfusion; sixteen is a large aggregate quantity in a female. When the transfusion has been successful, the pulse begins to be perceptible at the wrist; the voice grows stronger; the spirits improve; the animal heat increases; the patient acquires the power of swallowing stimulants, and often falls into a deep sleep. Reaction commonly ensues on the next day; and the vein must be carefully watched lest it take on inflammation. It must not be concealed, that serous effusion sometimes follows the previous prostration; and the patient, saved by the operation from perishing of hæmorrhage, falls a victim to the debility which it leaves behind.

By this operation, which is described in the lectures of Dr. Blundell, in Vol. xiii. of the London *Lancet*, that gentleman, and others also, have often obtained the happiest success in the most trying of all situations in which the accoucheur can be placed.

The operation of injecting *saline fluids* is not of equal delicacy, and the patented brass or pewter clyster syringes sold in the shops, and fitted with silver tubes, are excellent for its performance. Upon an emergency, perhaps, a *silver blow-pipe* attached to the pipe of a common pewter syringe, might answer the purpose. The precautions to be taken are however the same. The matter of the injection, not being, like blood, liable to deteriorate, needs no special attention. A very large quantity also is at once injected; and, other things being equal, the larger the dose, the better have been the effects. Seven pounds were on one occasion thrown at once into the median basilic vein; in nine hours, fifteen pounds had been injected. In Dr. Latta's second case, the first which succeeded, three hundred and thirty ounces were thrown in in twelve hours. In forty-eight hours "the woman smoked her pipe free from distemper." The vein upon the dorsum of the thumb is very suitable, and convenient for this operation.

It is, however, well known, that although a favourable change is speedily manifest, it is apt to be of but short duration. The diarrhœa returns, and the patient sinks as low as before. In that case, the injection must be repeated. The proper temperature for the fluid is 112° Fahr., and it should be delivered slowly. Consecutive typhoid fever frequently sets in, and must be suitably combated; although it

is believed to be made milder by the injection, than it is when it occurs in the natural way.

The vein, if it does not heal by the first intention, should be poulticed; and it is thought to be safest to make but one injection through the same orifice, for fear of phlebitis. (*See Latta's Letter. Lancet, for June* 1832.)

Besides the instruments of Dr. Blundell and Mr. Read, which, as has been stated, are specially intended for the purpose of transfusion, we shall now describe a syringe of an ingenious and excellent construction, which is capable, besides the operation of transfusion, of fulfilling every end for which an instrument of the kind can be required. It consists of a brass barrel, having a side-branch and an end, upon both of which, tubes, &c. may be screwed. The bulb at the end is closed by a stop-cock; which stop-cock is turned and opened, or again reclosed, by means of a key, or trigger upon one side of the barrel, which is alternately pressed upon, and relaxed, like that of a German flute.

The instrument being held in the left hand, and the tubes, &c. screwed firmly on, the barrel is filled from the side-branch, by raising the piston with the right hand; the left thumb is then made to press upon the key of the instrument, by whose action, the stop-cock, describing the fourth of a circle, is turned parallel with the length of the barrel; the piston is then to be pushed down, and the fluid injected along the tube at the end branch. By keeping the key down with the thumb, and drawing up the piston again, the pump is refilled through the end; and may be emptied from the side-branch, by taking off the thumb from the key, and pushing down the piston. By a little practice, sufficient dexterity may be acquired to work the key with speed and certainty.

By means of the tubes and ends which may be screwed to the instrument, the rectum, bladder, stomach, and the tunica vaginalis after the evacuation of a hydrocele, may be injected and emptied; and a cupping-glass or breast-cup with a stop-cock, may be exhausted in like manner by the syringe. It may be held in any position, and the tubes do not require to be changed for varying the motions of the instrument, in which respect it has an advantage over others now constructed. The proper average size for a pump to answer these various purposes, is five inches in length, with a diameter of one inch and a half. They are made by Mr. F. Liese, No. 7, Liberty Street, New-York, who is extensively engaged in the manufacture of this kind of surgical apparatus.

WOUNDS.—*Burns.*

Note XXI, p. 327.

Burns and scalds are undoubtedly to be looked upon as accidents of a very serious nature, capable of producing instant, or very speedy death; or tending to the same result, after intense agony and long protracted suffering. They are of very frequent occurrence, and it becomes every practitioner to be well aware of the best means which are to be put in practice to alleviate the pain they occasion, or to bring them to a happy termination. The horrid personal disfigurements of which they are productive, give them an additional interest in the eyes of the physician.

Burns are always the result of the tendency which all heated bodies have, to attain, by the radiation of their caloric, an equilibrium with surrounding centres, or objects. But, for the production of a burn of any intensity, the close contact of a heated body, particularly of flame and boiling fatty matters which are at a highly elevated temperature and adhere from their unctuous nature, is necessary. The combustion of carburetted hydrogen, and other gases, and also of gunpowder, give rise to terrible injuries, notwithstanding the suddenness of their action; whilst phosphorus, sulphur, resin, and other bodies which burn rapidly with fusion, are yet more dreadful in their consequences.

The pain of a burn is always greatest when the disorganization has been slowly effected, owing to the low temperature of the heated body. When a burn takes place, the eschar which forms above, prevents the heat from striking to the parts beneath. A young man in running through a foundry, rested his foot for a moment in a trough through which some of the molten metal was passing; the burning stream encountered it, nor was it withdrawn until the foot and the lower part of the leg were wanting. The sufferer experienced no pain, nor was he at first aware of the horrible mutilation that had taken place. These facts are not wholly unimportant, as will appear in the sequel. Pain may be instantly fatal, from the creation of intense cerebro-nervous irritation. An autopsic examination displays the digestive canal inflamed, the brain congested, the serum of the ventricles tinged with red, as well as that which moistens the pleura, pericardium, and peritoneum. The bronchia are likewise florid, and their secretion sanguinolent. The knowledge of these lesions we owe to the investigations of Baron Dupuytren. Should, however, the pain not be sufficient to cause death, coma and unconsciousness are often induced. The pulse is small, the body cold and pale, respiration slow, the limbs are inert and yield to their own weight. This annihilation of the senses generally ends in speedy dissolution. Sometimes, however, there ensues reaction, the violence of which it is necessary to control.

In a burn of the first and second degrees, the pain lasts as long as the cutaneous irritation to which the injury gave rise, and subsides with it. Not so in those in which the skin and rete mucosum have been disorganized. After the eschar has

formed, the pain ceases, and the parts beneath seem to have lost all sensibility. This is a deceitful calm of but short continuance. On the fourth day, the eliminatory inflammation sets in, and with it occurs pain of greater, or less intensity, according to the sensibility of the part. The burn being extensive and superficial, there ensues fever, sleeplessness, redness and dryness of the tongue, extreme thirst, every symptom, in short, of acute gastro-enteritis, with much nervous excitement. From these occurrences, a fatal issue frequently results; and thus, in the majority of cases, perish those, in from three to eight days, who had withstood the first shock of the fire upon their systems. It has been remarked, that the sufferers from injuries of this kind, breathe with difficulty, and labour under great oppression: this is the effect of high bronchial irritation. It happens to many, who have been injured by the bursting of boilers, to have true cynanche, for which tracheotomy offers the only chance of relief. It is singular, that in burns of yet higher degrees of intensity, this subsequent inflammation is not productive of as much pain, as in those of which we have now spoken; a fact that is of use in their diagnosis.

There is yet a third danger which hangs over those who have escaped from the two perils, pain and eliminatory inflammation. No sooner have the sloughs of an extensive burn separated, than suppuration commences, which, by its length of duration and profusion, may gradually enfeeble the physical powers, and terminate fatally by excessive attenuation. The longer the loss of substance is in being filled up, or the cicatrix in forming, the longer is the patient compelled to undergo the loss of nutritive materials which suppuration induces, and the greater is the danger that he may sink beneath its debilitating effects.

To these three dangers, there remains a fourth to be added; that of erysipelas, and phlegmonous inflammation, with all their concomitants: abscess, muscular detachment from the burrowing of the pus, suppuration, &c.

A burn of the second and third degrees, which covers one square foot of the cutaneous surface, is a very serious occurrence; and one of thrice this extent is generally fatal, at one or other period of its progress. Should it however recover, it is without deformity; for, as the skin has not been destroyed in its full extent, there occurs no retraction of the edges of the wound.

A burn of the fourth, fifth, and sixth degrees, on the contrary, in which the integument has been wholly disorganized, must heal, after the profuse suppuration with which it is attended, by the formation of a new epidermis, which is to close the solution of continuity by forcibly reapproximating the edges of the wound. Now, in this kind of injury it is, that the deformities resulting from the scars of burns are most to be dreaded; nor is the use of apparatus, however solid, always able to control their formation. It is not uncommon to see the fingers turned back upon the dorsum of the carpus, and blended with it; the whole hand fastened to the fore-arm; the fingers to each other; the foot twisted in various ways, adhering as a shapeless mass to the leg; the leg attached to the thigh; the thigh to the abdomen; the nucha adherent to the back; the head drawn violently against the shoulder, and the chin against the chest. The upturning of the eyelids, and the attachments of the nose and lips, are familiar to all, from the frequency of their occurrence. The sight of the eyes, moreover, is sometimes lost, and the perviousness of the natural orifices occasionally destroyed. Mortification may instantly result from a burn; or it may first inflame, and then mortify; but it is generally the inflammation which is the most to be dreaded.

The division of Burns made by Baron Dupuytren, which is highly extolled by his countrymen, is comprehensive, and separates the shades of disorganization of the skin and subjacent tissues; hence it is useful in aiding the prognosis, and in furnishing the indication of cure. But it is not in every case, easy at once to distinguish the modifications which he has detailed. Such is the violence of the impression upon the parts subjacent to that first attacked, that, although they do not immediately lose their vitality, they do so subsequently, from the intensity of the inflammation, and therefore, when eschars fall off, the wound is found to be larger than it was at first suspected to be.

Burns of the second degree are particularly remarkable for the production of phlyctænæ, which is generally instantaneous. They differ in size and number; and new ones often appear after some time, or the first increase in size. The cyst is constituted of the epidermis, which is detached from the rete mucosum. This sinks when they are opened, desiccates, and falls off in a few days; leaving a suppurating surface. This is not an invariable result; but a common and troublesome one, which often ends in ulceration. It terminates, otherwise, by the exhalation of plastic lymph, whence a new cuticle is organized; then, and not till then, does the severe pain which attends them, cease. There is no loss of substance, and consequently no scar; nor ultimately any change of colour.

The presence of greyish, yellowish, or brown spots or eschars, which are soft, yielding, and painful only upon pressure exercised with some degree of force, constitute the third degree; in which cuticle, rete mucosum, and the papillary surface of the derma are involved. The parts adjacent to the eschar are inflamed. Phlyctænæ, filled with a brown fluid, exist in many places over the eschars, which latter when they fall off, either wholly or by detached portions, leave behind superficial ulcerations, which are afterwards indelible from the smooth, thick and

shining layers which succeed to the parts destroyed. Burns made by gunpowder are always black, from the projection among the tissues of a few grains which did not deflagrate; they ever afterwards remain as black spots, if not suitably removed at an early period.

Burns which involve the whole thickness of the cutis are fourth in intensity. The eschars are more solid, thicker, denser, and the parts possess less sensibility. If water, oil, &c. have caused the burn, it is softer, grey, or yellowish; but if a red hot metallic body has inflicted it, it is dry, brittle, sonorous, and brown; intermediate are redness, erythema and phlyctænæ. It is in this degree of burn, that, on or about the fourth day, the dangerous eliminatory inflammation spoken of commences.

The eschar of a burn of the fifth degree is sonorous, friable, and grey. In the sixth degree, the limb is charred, horny, sonorous and easily broken. The burn involves all the organic elements in its ravages, and when it is detached, leaves a wound similar to that which is made in amputation. Should it be survived, the abundance of suppuration is much to be dreaded. In the last mentioned event, amputation, is often advisable, A case in which the right humerus was exarticulated at the shoulder joint, for an extensive burn of the arm and forearm, occurred a few years since, in the practice of Dr. Mott, at the New York Hospital. The patient, however, lived but a day or two after the operation, and her death was attributable to the unfavourable state of system induced by previous habitual intemperance.

TREATMENT.

"It seems to me," says Mr. S. Cooper, "that on the subject of burns there is, even at the present day, as much contrariety of sentiment, as in any part of surgery whatever;" and indeed, the remark seems to be fully corroborated on an examination of the plans of treatment which have been proposed by various practitioners. Most of the remedies in general use have been glanced at in the text; we shall mention a little more in detail, the practice of the authorities of the present day. The treatment of burns, however, will always require attention to their degree of their intensity. In those of the first degree, the pain and cutaneous irritation which has succeeded the injury, without effecting disorganization of the cutaneous tissue, will require to be moderated and allayed. In burns of the third and fourth degrees, it must be borne in mind, that about the third day, an inflammation of much acuteness will set in, by which the eschars of the integuments are to be cast off; and means must therefore be taken in the interim, to lessen its probable severity. Again, when suppuration is established, attention will be demanded to the state of the system, and the strength must be supported. Lastly, the cicatrization of the newly formed parts is to be favoured; and we are to endeavour, by every means in our power, to effect this without giving rise to anormal adhesions.

Sir A. Cooper advises us, by all means, to preserve the phlyctænæ from bursting, in order to guard against the suffering and suppuration which that occurrence creates; to apply evaporating lotions, viz. spirits of wine and the white wash, camphorated alcohol, &c., and to give opium internally. In burns which are severe enough *to separate the cuticle from the surface*, the spirits of turpentine is the best application. If it gives much pain, it may be diluted with oil, or aqua calcis. He further advises that opium and wine be given whilst the chilly state exists, and to discontinue it as soon as the heat is again developed. When the sphacelation begins to separate, fomentations and poultices are most useful; wine and opium are again called for, and towards the end, ammonia to support the constitution. When the cutis is granulating, cuticlem ay be speedily produced over it by the application of lint dipped in the following lotion. R. Sulphat. Zinci gr. ij. Liquor. Plumbi Acetat. dilut. 1oz. Place over the lint a compress of folded linen; and over the whole, a piece of oiled silk, to prevent evaporation.

Sir James Earle recommends the free application of ice, or cold water; if the shiverings, however, be great, this treatment will aggravate them much; and warm applications ought then, perhaps, to be preferred.

Mr. Lawrence believes that it is of very little consequence whether the vesicles are opened, or remain untouched, as long as the cuticle is not detached. He wholly disapproves of cold after extensive and severe burns; but thinks, that under those circumstances, the treatment recommended by Dr. Kentish is the best that can be adopted. Should the excitement from the burn be very great, he advises antiphlogistic means; and blood-letting in particular. He also mentions a plan of treatment suggested by *Dr. Ward*, of Manchester, which is said to be very effectual; that of covering the injured parts with a thick stratum of flour, by means of an ordinary dredger. *Lancet*, Vol. XVII.

Dr. Kentish advocates the stimulants mentioned in the text, which were, heated alcohol, ether, the liquor ammoniæ and turpentine. The latter application was made three times a day, and then a lotion of basilicon ointment softened with turpentine was laid on with rags. Internally he gave wine and brandy to call up the energies of the system to violent fever. Poultices were applied to the eschars.

Mr. Cleghorn directed tepid vinegar immediately to the burn, to be continued for some hours, until the pain is diminished. This being effected, emollient poultices were applied, and kept on for several hours: the parts thens prinkled with chalk, and the poultices reapplied until the cure was completed. He permitted the use of plain food, and moderate quantities of wine, ale, &c. He employed enemata, but proscribed purgatives altogether.

In our own country a practice has originated similar in principle to the application of flour; it is that of raw cotton, thinly spread out and finely carded. The theory with regard to the modus agendi of these agents, is that of excluding the atmospheric air from the denuded cutis. It is to superficial burns that cotton is most applicable. It should be laid on in successive layers, so thin as to be translucent, over which it will generally be advisable to put a compress and a bandage. A cabbage leaf is said to be a cooling and pleasant application to a superficial burn.

Baron Larrey dresses all deep burns with the saffron ointment spread upon linen, which he continues until suppuration ensues; in which case, it is replaced by unguentum styrax. As soon as the sloughs have separated, he returns to the saffron ointment, for which he gradually substitutes dry lint or compresses spread with cerate. Light broths, jellies, &c. constitute the diet of his patients.

M. Lisfranc, after having opened the bullæ and vesicles, removes the epidermis, which had been raised by the effusion; then covers the inflamed skin with a perforated compress spread with cerate, over which he applies a cushion of lint steeped in a solution of chloride of lime; and waters or sprinkles the dressings with the same fluid, that they may be constantly impregnated with it. If, upon its first application, it gives no pain, or if the cure is tedious, the activity of the solution should be increased; but if, on the contrary, it gives great pain, which lasts for some time after the dressing, and if whitish, albuminous layers form on the surface of the inflamed skin, he lessens its strength. To him, this topical application has always appeared to exert a very favourable action. (*Revue Medicale, quoted by Rayer, Mal. de la Peau.*

MM. Bretonneau and I. Velpeau recommend the application of compressing bandages to the part, in burns of the first, second, and even of the third degrees. These, without any other topical remedy, have assuaged the pain, impeded tumefaction, and brought the case, as speedily as simply, to a favorable issue. Phlyctænæ, if any there are, must be punctured before the bandage is applied; and if the cuticle is at any part denuded, a piece of court plaster is placed over the sore, and then the bandage is applied; this must be done, however, with extreme circumspection, lest strangulation and extensive gangrene should be the result. The bandage may either be dry or moistened with astringent fluids. But more numerous experiments are yet wanting to establish the efficacy of their practice.

MM. Borot and Cloquet have derived benefit from large applications of leeches upon the inflamed part; and in cases where the local irritation is very active, or extremely unresisting, it may be a valuable resource. In this case, of course, the antiphlogistic regimen, with quiet and anodynes, is necessary.

The state of coma which severe burns sometimes induce, should be treated by placing the patient in a warm bed; by stimulating frictions to the sound parts; and, in it, Mr. Cooper says, that opium gives more relief than any thing else. Ammonia may be offered to the nose, and the burned parts left entirely alone until reaction comes on; when, a suitable treatment should be instituted, and all stimulants abstained from. In burns of the fourth and fifth degrees, the fall of the eschars must be expedited by the application of large emollient cataplasms; and the granulating surfaces dressed with the utmost gentleness, and the greatest speed. The denuded part should be carefully guarded from long exposure to the air; and every rude touch, or awkward manipulation will add to the local irritation and increase its continuance. Lint, or linen, spread with the various cerates, should be directly applied to the wound, and kept on by suitable bandages; which, however, the profuse secretion of pus may oblige us to renew twice or thrice a day. A part only of the wound should be uncovered at once, and dressed before the others are removed; and to answer this end, the bandage of Scultetus is better than the single headed roller. Should the suppuration be, as it sometimes is, insupportably fetid, the solutions of the alkaline chlorides of M. Labarraque, may be used with a happy effect.

Attention to position, inflexible splints, bandages, wicks, compresses, adhesive straps, &c., are the means of keeping asunder corresponding surfaces; and the most unremitting attention, and the most powerful apparatus are indispensable to effect this object. If the cellular and vascular granulations are so luxuriant as to rise above the level of the neighbouring parts, and the cicatrices which are forming, tend to create unequal surfaces, or unsightly elevations, the nitrate of silver must be passed lightly over the most prominent granules, and compressing dressings applied in aid of the caustic.

Burns of the sixth degree demand amputation, but it should not be performed in the state of coma, nor after the establishment of high general and local inflammation.

In severe burns upon the trunk, the slightest motion is painful. A bed should be employed, which will allow of the sheets and mattress being changed (see page 35,) and a chamber-pan should be placed beneath the patient to receive his discharges, and guard against painful movements.

A proposal was made a few years ago by Mr. Henry Earle, by which a better proceeding should be substituted for the old and unsuccessful one of cutting across the indurated web, and then bringing the edges of the skin as much as possible together in a transverse direction with adhesive strips. It consists in removing the web entirely, in straightening the limb gradually, and in retaining it in as extended a condition as possible with splints. This plan requires long subsequent attention, and the utmost care in the use of solid and permanent apparatus.

The following remark of Dr. Christison, is valuable in a medico-legal point of view. If a line of redness be perceptible on the dead body of a burned person, near the seat of injury, not removable on pressure; and if, at the same time, phlyctænæ exist, it may be concluded with certainty that the burn was inflicted during life.

In the composition of this note, we have been mainly indebted to the article Burns, by M. Begin, in the *Dict de Med. et Chir. Prac.*; to that of Mr. Samuel Cooper; to the lectures on this subject by Sir Astley Cooper, Mr. Lawrence, and Baron Dupuytren.

SPONTANEOUS HUMAN COMBUSTION.

By this is understood the burning of a part, or of the whole of the human body, owing to the more or less close contact of some ignited substance. Of this extraordinary occurrence, *nineteen* well authenticated cases are now on record; one of which came under the observation of M. Dupuytren. It happens in all countries, but rather more frequently in cold ones, and in cold weather; and it generally results from the abuse of alcoholic liquors. The fattest people are the most liable to it; women rather more so than men. It is most commonly produced by the approach of a lighted candle, a heated stove, &c., but it does not appear that immediate contact is necessary for its generation. Upon the moment of the attack a little bluish flame is seen to spread over the whole body with extreme rapidity, or only to play about upon a few parts. Water fails to extinguish it; a most detestable odour fills the apartment; a thick black smoke rises from the carcase, and settles on the surface of the furniture, in the form of soot, unctuous to the touch, and of insupportable fetidity. In many instances, the combustion ceases only when the muscles are reduced to ashes, and the bones have crumbled into dust. If so, a pulverulent mass is perceptible on the floor, so small as that it appears impossible it could ever have represented an entire human body. All this may be effected in the space of an hour and a half. The cause of this phenomenon is yet undecided. The general opinion is, that from the great quantity of alcohol absorbed, the system reaches at length a period of saturation; and when tegumentary exhalation is no longer in proportion to internal absorption, the different systems of the economy, being thus impregnated, are easily consumed.

The facts known should be deeply engraved upon the memories of medical jurists, lest they should be exposed to condemn to the scaffold, one whom the suspicions of ignorance, or the insinuations of malevolence, had subjected to the charge of murder.

The following are the brief details of a recent case of the kind, which fell under the notice of the author of this article, in 1829. A woman named Bally, aged fifty one years, returned in her accustomed condition of gross intoxication, to her little apartment, on the evening of the 25th of December. At eight o'clock on the following morning, a strong odour of smoke being perceived, the woman was found by her neighbours, lying on the floor, almost wholly consumed. No fire had been made in the chimney; beneath her was a little earthern furnace; her chair was burned; the floor was covered with a blackish soot, but nothing in the apartment had sustained any injury. (*Devergie. Dict. de Med et Chir. Prac. Paris*, 1833.)

ON HÆMORRHAGE.

Note XXIII, p. 271.

So much has been said in the text, as well as by ourselves in the notes upon the tourniquet and tenaculum, on pages 369, and 372, and in those on Wounds, in this appendix, that the method of securing small arteries which are seen to bleed upon the surface of wounds, must now be perfectly understood. But such is the importance of the subject of hæmorrhage to the surgical practitioner, that a few further observations on that bleeding which proceeds from larger arterial trunks, seem called for, in addition to those made by the author. For the length of the following remarks their practical utility will, it is hoped, atone.

With external traumatic hæmorrhage alone we have to do. Like those of the soft parts, wounds of arteries are either *penetrating* or *not penetrating*, and are inflicted by incising, puncturing, lacerating and contusing bodies.

A large vessel may be *incised* either longitudinally, obliquely, transversally, or entirely across. A transversal wound of this sort, may involve one quarter, one third, one half, or three quarters of the circumference of the vessel: and each of these circumstances presents a difference, both as to the prognosis and the local phenomena. The former is made materially less favourable, according as the external wound is free or not; for an incision of any extent into a large vessel, with a free opening externally, is always imminently dangerous. But these occurrences are not always immediately fatal. Profuse gushes of blood may ensue; the patient faints, the bleeding ceases, it again recurs, and may continue to cease and flow alternately until life is lost. If the incision is a *longitudinal* one, but little divergence takes place between its edges; and after a first abundant flow, it may be closed by the secretion of organizable lymph, and healed by the first intention, with a scarcely perceptible cicatrix. An *oblique*, or a *transversal* incision, which occupies one fourth of the circumference of the artery, is different. The orifice assumes a rounded form, and the blood is effused and coagulated in the cellular sheath. Secondary adhesion of such a wound, though it is not impossible, is rare indeed. I

one half of the circumference of an artery of any size be transversally divided, the flow of blood is more profuse and death speedily ensues. If syncope, with a cessation of the bleeding supervene, death will be more tardy, and time may be given for prompt surgical aid. The chances for this, as well as for ultimate recovery, are infinitely increased, when two thirds of an arterial trunk are divided. Very considerable retraction may be effected, and much more time is allowed for assisting the patient. When an artery is wholly cut across, we need not say that a yet more favourable augury may be drawn.

From these remarks, it would appear that either death may result from a wound of an artery of some size at once, and in a few seconds; 2dly, that it may result from repeated renewals, at longer or shorter intervals; 3dly, that in the latter event, the timely interposition of surgical aid may arrest further hæmorrhage. We perceive, that from very extensive incisions into, and from complete transections of large vessels, less danger results, than when arteries are only imperfectly divided. Lastly, that if the outer wound be very large, and the arterial sheath opened, the danger is imminent.

It is because the parts are placed in a situation precisely opposite, that the hæmorrhage from a *puncture* of an artery is less, that sometimes none at all occurs, and that its local phenomena are different. The wound in the vessel being usually small and the outer wound narrow, but little blood immediately flows; and as the outer orifice refuses it a free egress, there occurs considerable effusion into the cellular tissue of the part. The puncture in the vessel being small, it is generally blocked up by a coagulum; and that in the integuments heals very often. If no adhesion takes place in the artery, the coagulum, sooner or later, becomes displaced, and the blood begins to be infiltrated, first, into the cellular sheath of the artery, next, amid the cellular tissue, between the muscles, fasciæ, and skin. This, sometimes, is slowly effected, and as the tumour, which is gradually formed, is soft and colourless, may lead to errors in the diagnosis. The swelling is sometimes immense, vague, extensive, and irregular, and hence technically, though erroneously, called a *diffused false Aneurism*. It generally pulsates, though this is at times obscure; in a majority of cases a feeble fluttering may be felt about the wound in the skin. (*See Am. Jour. of Med. Sc. Aug.* 1831, for a case of this kind, by Dr. Mott.) The sequelæ of this malady are often disastrous; gangrene and death resulting from the strangulation caused by the infiltration of blood. On the other hand, this blood may be absorbed, the wound of the vessel heal, and the bleeding be finally suspended. To produce the aneurism, wounds of small trunks equally suffice. (See p. 310, 503.)

The next consequence of a wound of this kind, to which we shall briefly advert, is the production of a circumscribed tumour, formed of cellular parietes, situated over the wounded artery, by which it is supplied with blood. This is the *circumscribed false Aneurism*. It occurs at a longer or shorter time, and sometimes even years after the accident, and is owing to infiltration into the cellular sheath of the vessel, which is distended in a cystiform manner, and which, increasing usually slowly and regularly, at the expense of the neighbouring cellular tissue, may attain a very large size. A peculiar sound is both felt and heard in this tumour, to which the term *susurrus* has been applied: it is caused by the passage of blood through the narrow aperture between the artery and the sac. The operation for aneurism is called for by this disease. When a vein has been transfixed along with a neighbouring artery, the blood of the latter flows into it, and hence arises a tumour called *Aneurismal Varix*. It is commonly met with in the bend of the arm, from injury done in phlebotomy, but may occur elsewhere with equal facility. Generally it is neither large nor inconvenient.

When it was observed that upon the occurrence of syncope, the flow of blood from a divided vessel was momentarily arrested, or definitively suspended, it became a matter of great interest among surgeons, to discover the means by which nature effected the cure. Among the leading investigators of this subject were Petit, Morand, Sharp, Pouteau, John Bell, Jones, and Beclard. The results at which the two latter have arrived we shall briefly enumerate.

So soon as the impulse of blood is sufficiently slackened to allow of its doing so, the completely divided artery retracts into its sheath. In this sheath the blood coagulates, and this is the *external* coagulum. While this goes on outwardly, an *inner* coagulum is forming within the vessel, thin and conical. Thirdly, there occurs a trifling contraction about the edges of the divided artery, by which its calibre is lessened; which contraction ultimately ascends to the nearest collateral branch. Thus the flow of blood is temporarily arrested. The efficacy, however, lies in the outer coagulum; and, in vessels of moderate size, the contraction spoken of, is doubtless, likewise, an agent of some power. Traumatic inflammation now occurs in the edges of the ends of the artery, by which an ultimate obliteration of the vessel is to be effected. Lymph is poured out, as well between them, as between the artery and its sheath, forming a hard, friable, and whitish mass, in which the ends of the vessel are lost. Next, and lastly, the outer and inner coagula are absorbed, and the artery becomes a ligamentous cord. The organizable matter, likewise, is taken up from the cellular sheath, which again becomes permeable and elastic. Such are the occurrences which take place on the cardiac side of the vessel. Those of the other end are ulteriorly not different; if there be much freedom of anastomosis, it also freely pours out arterial blood. On the contrary, if its inosculations be

few, a uniform and not jerky stream will flow, not always possessing the qualities of arterial blood. The blood, in travelling through its anastomotic channels to reach the lower orifice, has lost those properties. There is yet another circumstance connected with the arrest of Hæmorrhage, which deserves to be noticed. It is a fact, too well established to admit of denial, that large vessels will remain *open and dilated and yet not bleed.* It would appear, that in *certain cases*, the blood is influenced by something beside the mere vis a tergo, and that when it arrives at the bifurcation nearest the vessel, it enters that, and does not pass along to the divided extremity of the other, as if the latter had ceased to attract it. A want of the exercise of attraction by the capillaries, may play some part in causing this phenomenon.

Secondary hæmorrhage from arteries is always to be dreaded. It may occur sooner or later; the removal of coagula, an increase of circulatory action, ulceration instead of adhesion of the arterial coats, sloughing after lacerated and contused wounds, &c., may also cause its appearance. It may proceed from either end of the vessel, or simultaneously from both extremities if the wound has been transverse.

The blood gushes from a divided artery in a full, rapid, and impetuous stream, which, although alternately elevated and depressed, is nevertheless *continuous.* The blood is of a scarlet hue, unless it issue along with venous blood, which being black, may mask its colour; though, upon close inspection, the separate streams may be detected. If pressure above the wound arrest the flow, the diagnosis is complete. Let it not, however, be supposed, that to these signs any infallibility is to be attached. No jerky stream occurs, where the exit of the blood is broken upon the sides of the wound. *A jet of scarlet blood, flowing in jerks, may issue when a vein alone is opened; and uniformly black blood may be poured from an arterial orifice.* In phlebotomy during fever, great alarm might very naturally be excited lest the brachial artery had been opened, from the jerky stream and colour of the blood, the result of accelerated circulation, did we not make pressure below the orifice, by which it would, if venous, at once be arrested.

When from the freedom of the bleeding, we are satisfied that a considerable trunk is wounded, it becomes very important to decide which the vessel is. Something may be gleaned from the situation of the wound. If the principal trunk have suffered recently, pulsation will be arrested below; after a few days, however, anastomosis will have restored it. The introduction of a probe, by the direction it takes, will enable us to form some opinion as to the vessel and its depth; whether the wound in it is at its upper or lower part; and it will also detect any obliquity between the two orifices. Thus, also, we are led to reflect what important parts it will be needed to divide, in order to arrive at the seat of lesion. But, to come to all these conclusions, is, in many parts of the body, excessively difficult; and not less so very often, is the operation for securing the vessel.

A surgeon will either see his patient during the flowing of the blood from the wound, or after the suspension of the discharge. In the first event, he will perhaps be enabled to pass his finger down upon the vessel, and so restrain the flow; he may, perhaps, be enabled to seize its end between his finger and his thumb; or, he may make pressure on the principal vessel of the limb, with a pad, a key, his fingers, or thumb, until proper means can be procured for permanently arresting the hæmorrhage. The stick tourniquet (p. 368) will be found serviceable, until the screw instrument can be obtained. This being done, if the ends of the vessel can be seen, we secure them with the tenaculum or forceps, putting our ligature on *both orifices;* for it is a general rule that the two ends of every divided artery should be tied, although the lower does not bleed at the time of the operation. (See note on p. 373.) Torsion may here also be tried.

The ligature of a vessel which can be held between the fingers will offer no difficulty. The occasional occurrence of cures, by compression, ought not to induce us to neglect to tie the wounded artery. If when the surgeon arrives, the person have fainted, or the hæmorrhage have ceased, he should first endeavour to make himself master of the bleeding, and may then proceed to administer stimuli, or sponge the wound and remove the coagula, to detect the nature of the injury, if it be of size sufficient to be so inspected.

We are now to consider the method of proceeding in cases of incomplete divisions of arteries, of narrow external orifices, and in diffused false aneurism, in all of which, we are to cut down and tie the artery above and below the wound, whenever it is practicable. This plan of procedure is more obligatory in wounds in which partial divisions of the vessels exist, than in those in which they are completely cut across, because, in them, no retraction can occur. If we have to treat a diffused false aneurism, the longer the operation is delayed, the more difficult it will be; the tissues will be infiltrated with blood, by which the depth of parts is materially increased, their natural situation altered, and every obstacle aggravated. Another reason for an early performance of the incision is, that if bleeding occurs consecutively in a wound distended, inflamed, injected with lymph and pus, a search for the vessel would not only be insufferably painful, but would prove probably useless; or, if the artery were found, the ligature would soon cut through its inflamed tissues, and the hæmorrhage recur. In that case, it would become necessary to tie the main trunk, between the injury and the heart, at a distance from the wound; or below it, if the blood came from the lower extremity. This precept

is, indeed, a capital point in the treatment of this lesion. Before we begin our incision, we apply the tourniquet upon the main artery of the limb, or, if that cannot be, have it compressed by an able assistant. Observing the situation of the external wound, and the direction taken by the wounding instrument, we lay bare, by successive incisions through the integuments, &c., that part of the artery in which we believe the opening to be, always in the direction which the vessel takes. Great advantage is obtained by making the outer incision very free. If it is a diffuse false aneurism into which we are cutting, we turn out the coagula of blood, and come to the wounded vessel. It is generally detached from its sheath by the injection of the blood, and its orifice, if not at once observed, will be seen on gently slackening the tourniquet. A probe may, in this event, be passed in at the orifice to raise it; two ligatures are to be passed under it, one above, and one below the wound, and tied; the vessel afterwards being divided between them. If the vessel be still firmly adherent to the parts beneath, an aneurism needle may be required to put the ligatures around it.

In cases, such as we have described as calling for an incision down upon the wounded artery, it is sometimes necessary to place the ligature upon that vessel nearer to the heart. When the exact situation of the injured artery is uncertain; or when, although it is known whence the bleeding flows, it would be inflicting too much injury upon the parts to go down deep enough to secure it: to tie the vessel itself, or the trunk from which it springs, higher up, may be indispensable. The chances of complete success from this measure are small: for, although the hæmorrhage is sometimes wholly and permanently arrested, we generally find that the collateral circulation brings back the blood to the gaping orifice, whence follows a reproduction of the bleeding, or an increase of the effusion of the fluid among the tissues. A powerful antagonist to the method of Hunter has recently arisen in the person of Mr. Guthrie, who opposes its performance, *whatever be the situation of the artery*, and hesitates not to go through fasciæ, muscles, &c. to reach the point of lesion. Yet to this alternative we may, in cases of peculiar difficulty, often be reduced.

When such is the situation of a vessel, an artery of the perinæum for instance, that it cannot be cut down upon, and it lies too deep to be tied with the fingers, twisting with forceps, if its end can be seized, or compression and tamponing, if it cannot, alone remains for us to practise. Hæmorrhage of any severity from a small trunk which is imperfectly divided, as the temporal or intercostal, will sometimes be stopped by completely transecting the vessel.

Of lateral compression, and the actual cautery, enough has already been said in the body of the work; and the subsequent dressings are also fully detailed in it under that head, and in the articles on wounds and on hæmorrhage.

In hæmorrhage from *veins*, it is upon compression that we must rely; for, as the author has observed, such is the danger of phlebitis, that a ligature should never be applied to a large venous trunk, unless it be unavoidable. We know, however, that the femoral vein is often tied in amputations without unfavorable occurrence; we know also, that the internal jugular was, by Mr. Guthrie, seized with a tenaculum, and its cut edges so brought together and tied, as not to interfere with the perviousness of the canal; and that the wound healed, and the vein remained open. It is likewise certain that the same vein was also secured between two ligatures, in the New York Hospital, in 1830, by Professor Stevens; that the ligatures came away in fourteen days, and the case recovered without any peculiarity; all of which circumstances may serve to justify the tying of large veins when rendered necessary by the profuseness of hæmorrhage, or the failure of compression.

Lawrence, *Lect. in the Lancet*, 1829—30. Berard, in *Dict. de Med.* Arteries (*wounds of*). Aneurism (*false primitive*).

P. S. It was stated in the note upon page 170 of this volume, that the exsection of the clavicle was a *unique* operation. Since that remark was in press, however, there has been published, in the *Am. Jour. of the Med. Sciences* for Nov. 1833, the account of a second case, in which this formidable undertaking was again successfully achieved by an American surgeon, Professor J. C. Warren, of Boston, Mass. The disease for which the bone was removed was an osteo-sarcoma; but we regret extremely to add, that the patient died unexpectedly in the fourth week after the operation; apparently from the constitutional impression of so severe a procedure, on a scrofulous and feeble habit of body.

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